

Proj. No.: RA 140 DESIGN, BUILD, COMPLETE AND MAINTAIN SHEIKH JABER AL-AHMAD AL-SABAH CAUSEWAY PROJECT (MAIN LINK)	Employer: STATE OF KUWAIT MINISTRY OF PUBLIC WORKS	Request No. RA140-HDC-22-CBR- DRW-0069-01
Engineer's Representative:  dar al-handasah TYLIN INTERNATIONAL	Contractor:  HYUNDAI ENGINEERING & CONSTRUCTION CO., LTD.	Date 20/02/2016

Transmittal of Design Drawing

1. Subject Description

Detailed Design - Main Bridge Steel Cross Beam Drawing Package

2. Submittal Details

Item Reference	Rev.	Description	Copies
RA140-22-BRG-CW-DW-34470	B1	Main Bridge Steel Cross Beam Drawing Package	1

NOTE

- Including Comment & Response Sheet
- Including SYSTRA & HDEC-CGCC Quality Control & Quality Assurance Checklist

These are transmitted for:

- ☐ Your information
 ☒ Approval
 ☐ Checking
 ☐ Review and Comment

We certify that the above drawings have been designed by Systra and consented by AECOM

Submitted by : Chan Soo Park / Project Director

Signature: 

3. Engineer's Approval

– Refer to our comments on the attached comments and response sheets.

- ☒ Approved
 ☐ Approved as noted
 ☐ Revise and resubmit
 ☐ Rejected

Engineer's Signature: 

Date: 20/3/2016

Approval shall not relieve Contractor of his liabilities under the Contract or constitute authorization of any change to Contract Documents.

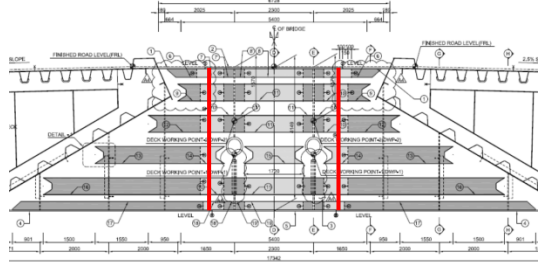
RA140-HDC-22-CBR-DRW-0069-01

RA140 - Hdec/CGC form 07 rev 01

Comment & Response Sheet

Document No: RA140-22-BRG-CW-DW-34470-B1-DR2/C

Ref. Transmittal No : RA140-HDC-22-CBR-DRW-0069-00 (Rev. 00); RA140-HDC-22-CBR-DRW-0069-01 (Rev. 01);
 Ref. Report No & DWG package No : RA140-22-BRG-CW-DW-34470-B1
 Document title : DETAILED DESIGN – MAIN BRIDGE STEEL CROSS BEAM DRAWING PACKAGE
 Comments Issued by & date : T.Y. Lin International (Rodriguez) on 16 March, 2015
 Answer Issued by & date :
 Consent Classification : A (A: Consented to, authorized to proceed / B: Consented to, subjected to comments / C: Revise & Resubmit, incorporate comments
 W: Rejected, not consented to, reason Noted)

No.	Rev.	Reference		Comment rev. ²	Comment	Response	Cat. ¹	Status ³
1	A4	34471	General	1 st comment	Provide information regarding the field welding procedures.	 After the hybrid (concrete-steel) girders are erected into position, steel cross beam 1, 2, and 7 are connected with the girders by field welding. The field welding is applied to the red line as shown in figure above.	1	
	B1			2 nd comment	Noted.			AA
2	A4	34471	Plan and Elev. Views	1 st comment	Explain why welds adjacent to the anchorage tubes are shown as field welding splices. Could these welds be done in the shop?	U-Ribs in the middle part are welded at the shop. The drawing has been revised.	2	

- 1) Category : Cat A = Agreed with response, Cat 0 = Observation / Note, Cat 1= Information Required Only, Cat 2= Major Comment / Revision Required
 2) Comment Rev.: 1st comment, 2nd comment...
 3) Comment Status after response: AA = Resolved, implemented and closed, BB = Resolved – not yet implemented, CC = Unresolved



	B1			2 nd comment	Noted.			AA
3	A4	34471	Note 2	1 st comment	Clarify is A500 steel is used for anchorage tubes only.	ASTM A500 steel is only used for the steel truss members (HSS) inside the steel deck and it is not applied to steel cross beams. This note has been deleted in the drawing.	1	
	B1			2 nd comment	Noted.			AA
4	A3	34492	Detail 6	1 st comment	Detail 6 is taken at Section 13 (Drawing 34491) and it shows an HDPE Duct. Since Section 13 is very close to the anchor plate, this does not seem correct. Please verify.	The gap between anchorage tube and u-rib in Detail 6 has been revised correctly as shown in Section 13.	2	
	B1			2 nd comment	Noted.			AA

- 1) Category : Cat A = Agreed with response, Cat 0 = Observation / Note, Cat 1= Information Required Only, Cat 2= Major Comment / Revision Required
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SYSTRA – QUALITY CONTROL & QUALITY ASSURANCE CHECKLIST											
Reference	RA140-QPM-06072-2016-02-17-HS										
PACKAGE :	34k	MAIN BRIDGE - SUPERSTRUCTUR									
Document reference	Revision	Title 1	Title 2	Title 3	Required Action by ER		Basic Design Comments Integrated	Detailed Design Comments Integrated	ICE Comment Sheets Included	ICE Reports Included	Status (Consented by ER)
		MAIN BRIDGE	SUBSTRUCTURE		For Review	For Information					
RA140-22-BRG-CW-DW-34470	B1	MAIN BRIDGE - SUPERSTRUCTURE	STEEL CROSS BEAM	DRAWING PACKAGE	✓		✓	✓	✓ (on A4)	✓ (on A4)	
Reference of ER comments integrated this submission (Comment and Response Sheets Included) :			RA140-HDC-22-CBR-DRW-0069-00 (Rev. 00)								
Sysstra hereby certifies that this submission fulfil Sysstra quality control requirements and procedures :			Drawings and reports/calculations have been compared and are consistent		✓						
			Drawings filled properly		✓						
			Drawings checked for technical adequacy, legibility, mathematical and drafting accuracy		✓						
			Drawings are in agreement with other disciplines		✓						
			Conformance with Design Basis and applicable design specification		✓						
			Revisions have been clouded		✓						
			Drawings were properly checked using color codes (Red, Green, Yellow).		✓						
			Dimensions and units correct and consistent		✓						
REMARKS											

HDEC & CGCC - Quality Control and Assurance Checklist for RA140 Project

HDEC & CGCC certifies that this submission is properly reviewed by quality control process

SYSTRA QFM are properly filled	√
Consistency of the drawings and reports	√
Composition of the document and typographical error are properly reviewed	√
Drawing list and revision are properly checked	√

Completeness of the package

Related Document

Document No.	Rev.	Title	Transmittal No.	Submission Date
RA140-22-BRG-CW-DW-34470	B1	Main Bridge Steel Cross Beam Drawing Package	RA140-HDC-22-CBR-DRW-0069-01	20-Feb-16

REMARKS

Date	QC Engineer	Signature
18-Feb-16	YOO DONG YUN	



Contract RA-140 - Sheikh Jaber Al-Ahmad Al-Sabah Causeway Project – Main Link

Submission Ref. No.	RA140-TRS-1739	Title: RA140-22-BRG-CW-DW-34470-A3 -Main Bridge - Steel Cross Beam
Response Ref. No.	EKHC:AKML:60290056/8.2-2015010335T	

Response:	No adverse comment	☒
	Agree in Principle with minor Comments	☐
	Insufficient Information to proceed with Review	☐
	Major non-conformity found	☐

Remarks:

For detail please refer to the attached ICE report.

Exclusion:

- All construction information such as bar bending schedules, taking off information, locations of couplers/lapping and etc are all excluded in the review.

From : AECOM

Name : Edward K.H. Chan

Signature :

Date : 23-Nov-15

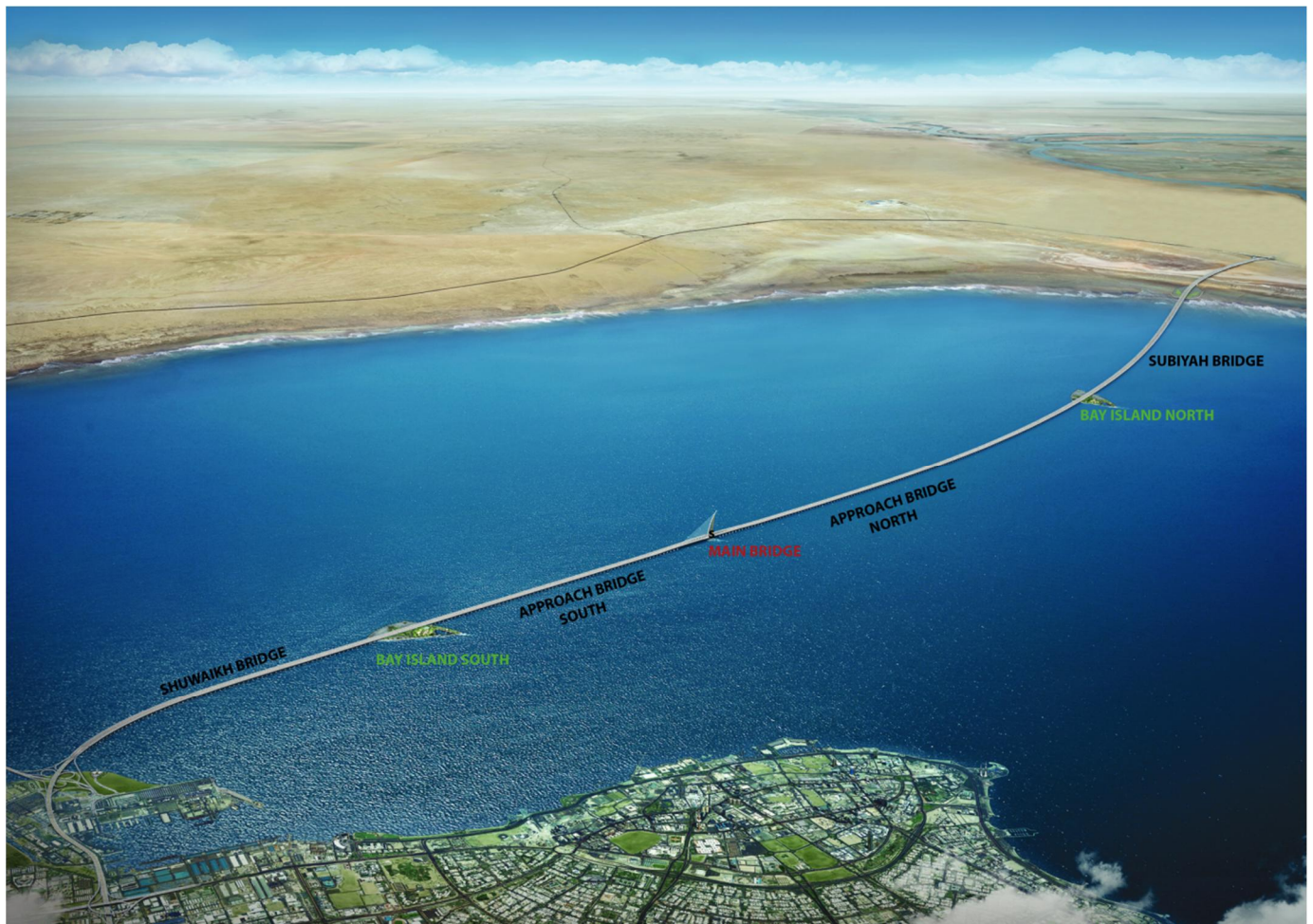
The Design, Build, Completion and Maintain

Sheikh Jaber Al-Ahmad Al-Sabah Causeway Project (Main Link) Contract No. RA140

Kuwait

ICE Check Report for Detailed Design Stage

TRS-1739 Main Bridge - Steel Cross Beam



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Appendices

Appendix A List of Non-conformance

Appendix B Approaches for Checking

1. List of Documents Checked

	Transmittal Number/Document No.	Title
Design Package	TRS-1739	Main Bridge - Steel Cross Beam
Drawings Package	RA140-22-BRG-CW-DW-34470-A4	Main Bridge - Steel Cross Beam

2. Contract Documents used in the Checking

a) Document III.1: General Specifications

- MPW, Roads Administration: General Specifications for Kuwait Motorway/Expressway System, August 2004 and amendments until Tender closing date.
- AASHTO LRFD Bridge Construction Specifications, 2nd Edition 2004, including 2009 Interim Revisions
- General Specifications for Buildings and Engineering Works for Ministry of Public Works year 1990 and amendments until Tender closing date.

b) Document III.2: Particular Specifications Revision 2M

c) Document III.3: Design Criteria Revision 2M

3. Frozen Scheme Reference in Basic Design Stage

Package/Document No.	Package / Document Title
RA140-22-BRG-CW-DW-34470-A4	Main Bridge - Steel Cross Beam
RA140-10-BRG-CW-TR-00814-B3	Design Basis-Bridge
RA140-10-ROE-RW-TR-00813-B1	Design Basis-Highway and Road
RA140-22-ROE-RW-DW-58000-A2	Bay Island South Road & Embankment Road Design - Plan, Profile & Cross Sections

4. Standards and Codes of Practice used in the Checking

AASHTO LRFD Design Specifications SI Units 4th Edition 2007

5. List of Non-Conformance Findings

See Appendix A

6. Approaches for Checking

See Appendix B

Appendix A

List of Non-conformance

ICE Check Report – List of Comments or Non-conformances

Document No : RA140-22-BRG-CW-DW-34470-A4-ICE3IC

Ref. Transmittal No	: TRS-1739
Ref. Report No & DWG package No	: RA140-22-BRG-CW-DW-34470-A4
Document title	: Detailed Design –Main Bridge - Steel Cross Beam Drawing Package A4
Comments Issued by & date	: by Dr. Yu, Guoxiong on 30 th July 2015, 28 th Aug 2015, 22 th September 2015, 03 rd November 2015, 20 th November 2015
Answer Issued by & date	:
Consent Classification	: A (A: No adverse comments / B: Agree in Principle with minor comments / C: Insufficient Information to proceed with review / W: Major Non-conformity found, revision required)

No.	Rev.	Reference	Comment rev.	Comment or Non-Conformance	Response	Cat. ¹
1	A1	Structural reference point DW-34471, 34483	1 st	Regarding working points (DWP-1, DWP-2, DWP-3) in the drawings, please mark up the structural reference point about the analysis model.	Working points were included the drawing of RA140-22-BRG-CW-DW-34653. Please refer to Attachment #1.	2
	A2		2 nd	There are missing the information that which point is a structural reference point among working points(DWP-1, DWP-2, DWP-3) in the drawings. Please clarify.	The structural reference point is DWP-2. The information of structural working point was included the drawing of RA140-22-BRG-CW-DW-34652.	2
	A2		3 rd	No further comments.	Noted.	A

¹)Category : Cat A = Agreed with response, Cat 0 = Observation / Note Cat 1 = Minor Comment Cat 2 = Major Comment / To be resolved

²)Comment Rev. : 1st comment, 2nd comment ...

Verified by: 

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RA140-22-BRG-CW-DW-34470-A4-ICE3IC

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No.	Rev.	Reference	Comment rev.	Comment or Non-Conformance	Response	Cat.
2	A1	DW-34483	1 st	There are missing the β1 angle of the stay cables and the coordinates of working points(DWP-1, DWP-2, DWP-3). Please clarify. SECTION E-E SCALE : 1/30	Working points and the angle β1 of the stay cable were included the drawing of RA140-22-BRG-CW-DW-34653. Please refer to Attachment #1.	2
	A2		2 nd	No further comments.	Noted.	A

¹⁾Category : Cat A = Agreed with response, Cat 0 = Observation / Note Cat 1 = Minor Comment Cat 2 = Major Comment / To be resolved

²⁾Comment Rev. : 1st comment, 2nd comment ...

Verified by:

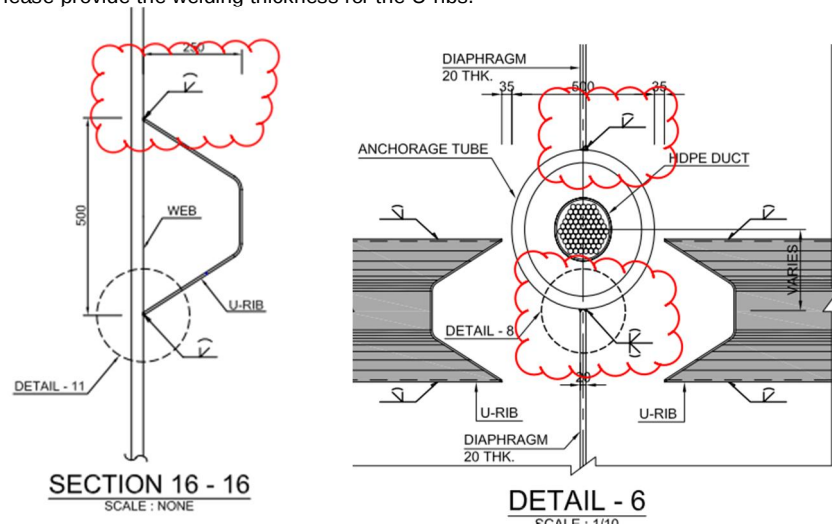
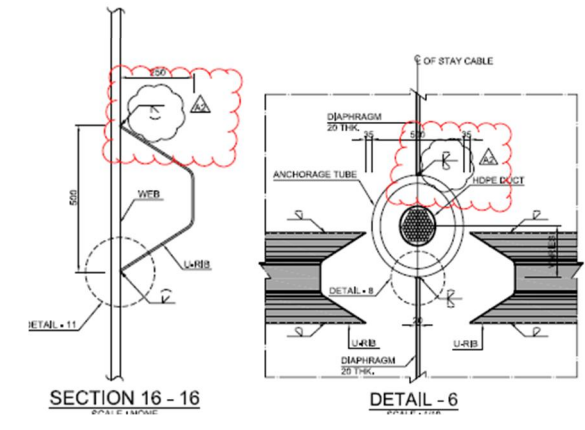
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No.	Rev.	Reference	Comment rev.	Comment or Non-Conformance	Response	Cat. ¹
3	A1	DW-34492	1 st	In the section 16-16, the direction of welding is wrong. Please clarify. Please provide the welding thickness for the U-ribs.  SECTION 16 - 16 SCALE : NONE DETAIL - 6 SCALE : 1/10 In the Detail-6, welding method between anchorage tube and diaphragm is difference at the both anchorage tube, Please clarify.	In the section 16-16 and Detail-6, welding marking was revised as follows.  SECTION 16 - 16 SCALE : NONE DETAIL - 6 SCALE : 1/10	2
A2			2 nd	No further comments.	Noted.	A

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²)Comment Rev. : 1st comment, 2nd comment ...

Verified by:

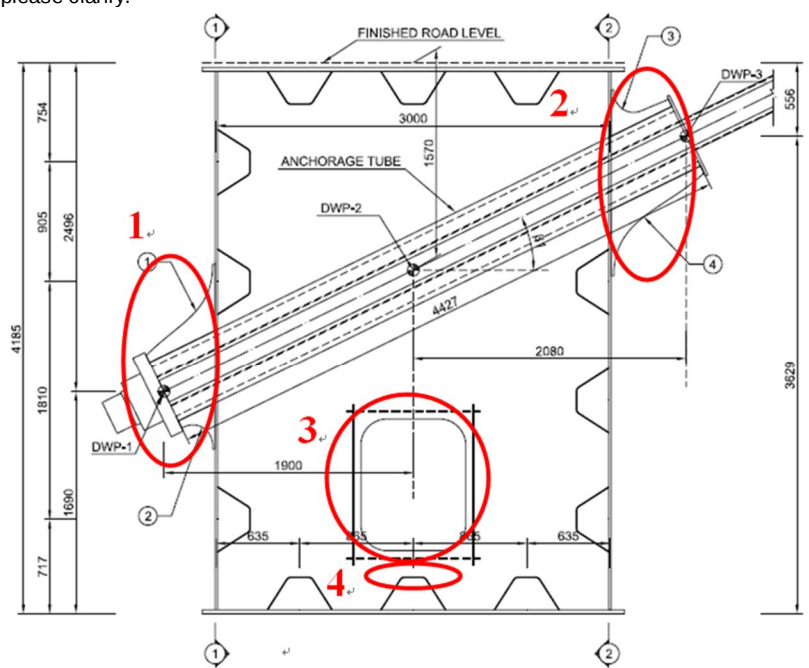


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4	A1	Structural resistance of anchorage zone	2 nd	From the FEA(finite element analysis) checking result, Summary of non-conformance of anchorage zone of steel cross beam is depicted in the figure below. Please refer to the noted positions shown in the figure and please clarify.  Position reference		2

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²)Comment Rev. : 1st comment, 2nd comment ...

Verified by:

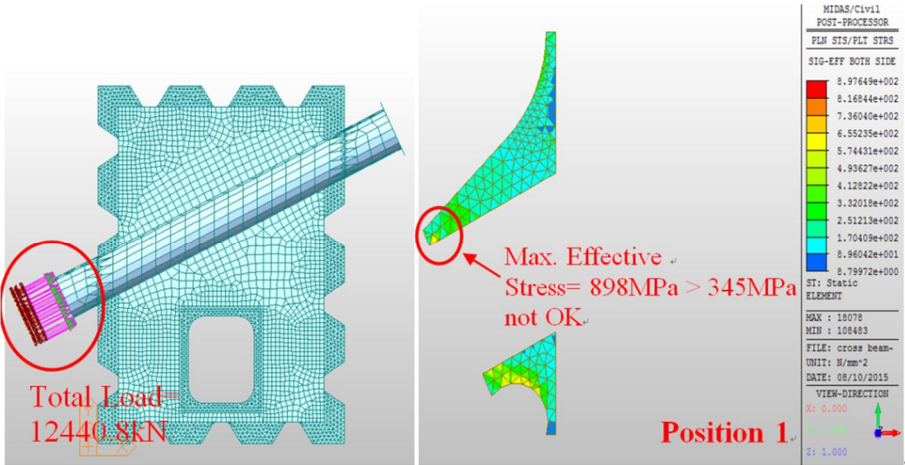


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Ref. Transmittal No	: TRS-1739
Ref. Report No & DWG package No	: RA140-22-BRG-CW-DW-34470-A4
Document title	: Detailed Design –Main Bridge - Steel Cross Beam Drawing Package A4
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No.	Rev.	Reference	Comment rev.	Comment or Non-Conformance	Response	Cat. ¹
4.1	A2		2 nd	1. A FE model was produced for checking the performance of steel cross beam, with a total load of 12440.8kN applied at the end of cable anchor as shown below (left) (Upper, lower and side plates are not shown). The modeled effective stress distribution of the stiffeners shown below (right) suggests that the stress experienced by the stiffeners exceeds 345MPa. Please clarify.  Max. Effective Stress = 898MPa > 345MPa not OK. Position 1.	Since we don't have the same results, could you please provide much more details about your model so we can compare: - What exactly has been modeled? - What are the boundary conditions? - Are all stiffeners included in your FEM models (including the manhole stiffeners)? Our first remark will be that concentrated stresses on an angle of a triangle element in a FEM model are irrelevant. You can see that while maximum stresses of 898MPa appear on a triangle joint, the average stresses in all elements around are less than 251MPa which is acceptable. For the bottom stiffener, the radius doesn't seem to be constant as it is on the drawing.	2

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²)Comment Rev. : 1st comment, 2nd comment ...

Verified by:

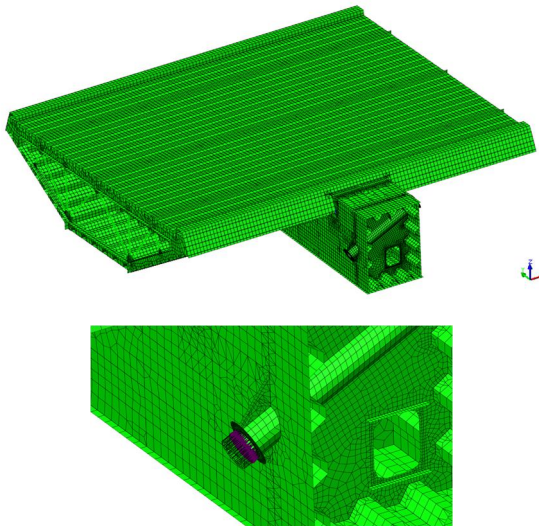


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No.	Rev.	Reference	Comment rev.	Comment or Non-Conformance	Response	Cat. ¹
4.1	A2	Structural resistance of anchorage zone	3 rd	- Our FE model was built with the intention to check the local effect of the cross beam SCB-1 under a cable load of 12441.7kN (strength limit state in the global model). Particularly, the stress concentration effect of the diaphragm bisecting the anchorage tube is checked. The model has been adopted rigid link boundary at the two ends of the cross beam model. The stiffeners at both ends of the anchorage tube and near the edge of access hole are all defined in the FE model. - We agree that results of some triangular elements sometimes may not be representative. In order to clear the confusion, quadrilateral elements are adopted in a much larger extent at regions that are considered not satisfactory. For the upper stiffener, it is observed that the problematic region spreads to other elements in the plate. - For the bottom stiffener, apart from the radius of the arc please also provide the arc length for better modeling. - In the revised model, the hollows between U-ribs and side plates are considered as part of the diaphragm, and the bearing plates are modified as hollow circular instead of solid circular section. Please also note that the thickness of these two stiffeners is modified to 45mm and the transverse spacing between the two anchorage tubes is widen to 2300mm in the updated model, according to the revised A2 drawing.	FE model for cross beam is shown below. The dimensions of structural components were changed. Some changes are listed as follows. Please refer to drawings for other changes. - Thickness of diaphragm plate : 20 mm → 30 mm for upper and lower plates - The thickness of formwork tubes : 45 mm → 50 mm - The location of access hole was shifted by 600 mm toward pylon  < FE Model >	2

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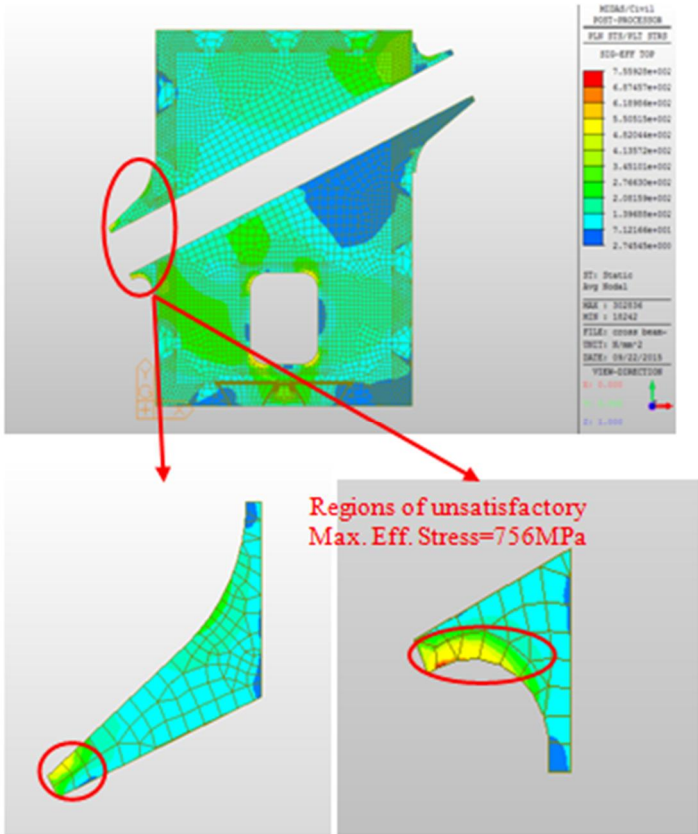
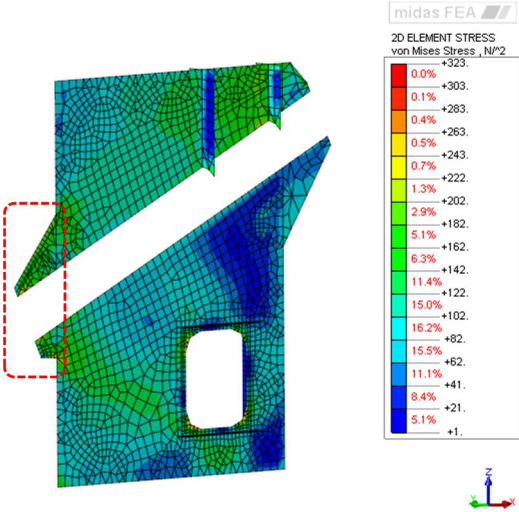
²)Comment Rev. : 1st comment, 2nd comment ...

Verified by: 

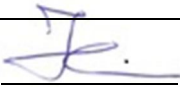
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4.1			3 rd	 Regions of unsatisfactory Max. Eff. Stress=756MPa	The results of the analysis in extreme limit state indicate that the Von Mises stress in cross beam diaphragm is generally less than 256 MPa, which is the material strength applied with resistance factor. The stress in stiffener in anchorage zone exceeds the material strength although the shape of the stiffener was changed (enlarged) to reduce the stress. The stress is however very local, thus it is thought the value could be negligible. Because : - Even if this area is plasticized, there will be no loss of structural integrity. - Also, the redistributed stress in the around area will still be within allowable stress. 	2

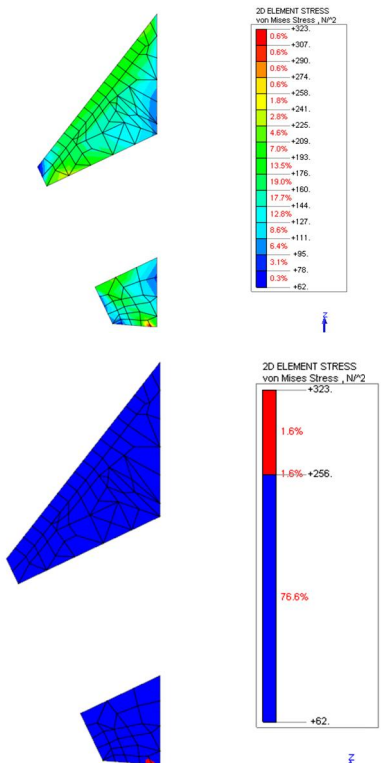
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No.	Rev.	Reference	Comment rev.	Comment or Non-Conformance	Response	Cat. ¹
4.1			3 rd		 2D ELEMENT STRESS von Mises Stress, N/m² 0.6% +307.0% 0.6% +290.0% 0.6% +274.0% 0.6% +258.0% 1.8% +241.0% 2.8% +225.0% 4.6% +209.0% 7.0% +193.0% 13.5% +176.0% 19.0% +160.0% 17.7% +144.0% 12.8% +127.0% 8.6% +111.0% 6.4% +95.0% 3.1% +78.0% 0.3% +62.0% 2D ELEMENT STRESS von Mises Stress, N/m² 1.6% +323.0% 1.6% +256.0% 76.6% +62.0% < The stress in stiffener in anchorage zone >	2

ICE Check Report – List of Comments or Non-conformances

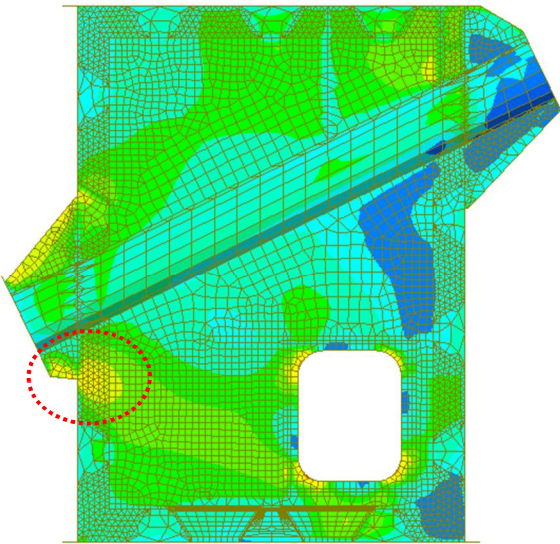
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Please specify the input cable force of your model. In the revised model presented below, the same cable load of 12441.7kN is used.

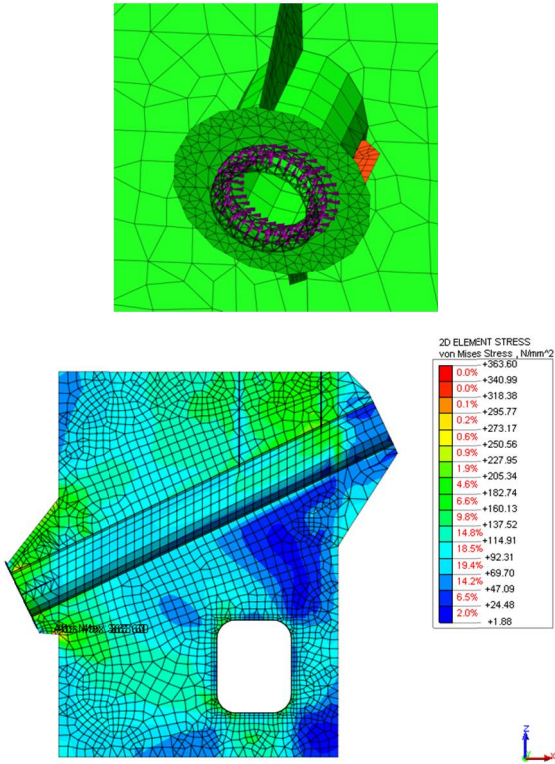
From the below FEA result, even if excessive von-Mises stress find in the below stiffener in anchorage zone, The excessive stress area is very local and it will be satisfy if welding thickness considering at this area. Therefore no further comments.

ICE recommends that additional stiffeners install to anchorage zone for considering of the construction error of anchorage install.



MIDAS/Civil
POST-PROCESSOR
PLN SIS/PLT SIRS
SIG-EFF TOP
3.84068e+002
3.49198e+002
3.14327e+002
2.79457e+002
2.44586e+002
2.09716e+002
1.74846e+002
1.39975e+002
1.05105e+002
7.02345e+001
3.53641e+001
4.93718e-001
ST: Static
Avg Nodal
MAX : 177526
MIN : 177220
FILE: cross beam-
UNIT: N/mm^2
DATE: 10/30/2015
VIEW-DIRECTION
X: 0.000
Y: -1.000
Z: 0.000

Noted.
The cable force of 12562kN was applied with lateral load of 2.5% of the cable force and the additional stiffeners were installed in anchorage zone as per ICE comment as shown in figure below.



¹)Category : Cat A = Agreed with response, Cat 0 = Observation / Note Cat 1 = Minor Comment Cat 2 = Major Comment / To be resolved
²)Comment Rev. : 1st comment, 2nd comment ...

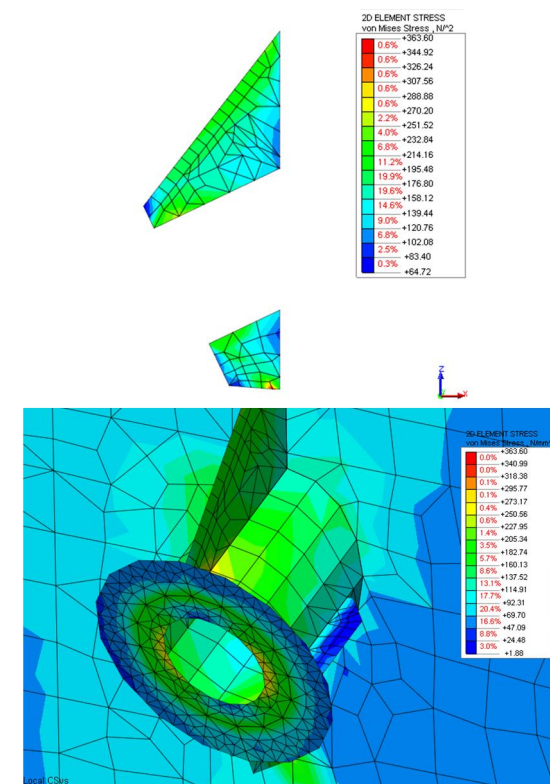
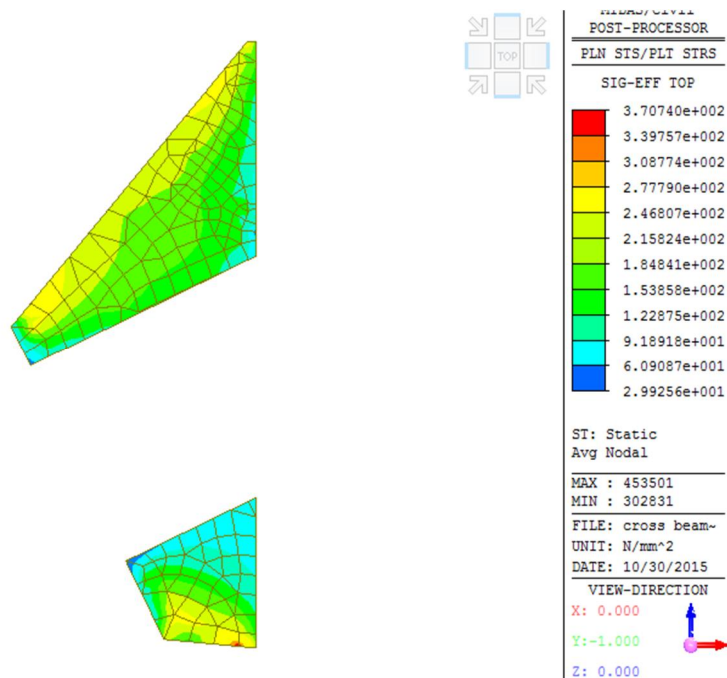
Verified by:

ICE Check Report – List of Comments or Non-conformances

Document No :

RA140-22-BRG-CW-DW-34470-A4-ICE3IC

Ref. Transmittal No	: TRS-1739
Ref. Report No & DWG package No	: RA140-22-BRG-CW-DW-34470-A4
Document title	: Detailed Design –Main Bridge - Steel Cross Beam Drawing Package A4
Comments Issued by & date	: by Dr. Yu, Guoxiong on 30 th July 2015, 28 th Aug 2015, 22 th September 2015, 03 rd November 2015, 20 th November 2015
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	A4		5 th	No further comments.		A
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²⁾Comment Rev. : 1st comment, 2nd comment ...

Verified by:

Signature: _____

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4.2	A2	2 nd	2. The modeled effective stress distribution of the stiffeners shown below suggests that the stress experienced by the stiffeners exceeds 345MPa. Please clarify.	As we said in the answer above, concentrated stresses in a single element of a FEM model are irrelevant, and all elements around the two triangles where maximum stresses appear have stresses around 300MPa which are acceptable.	2
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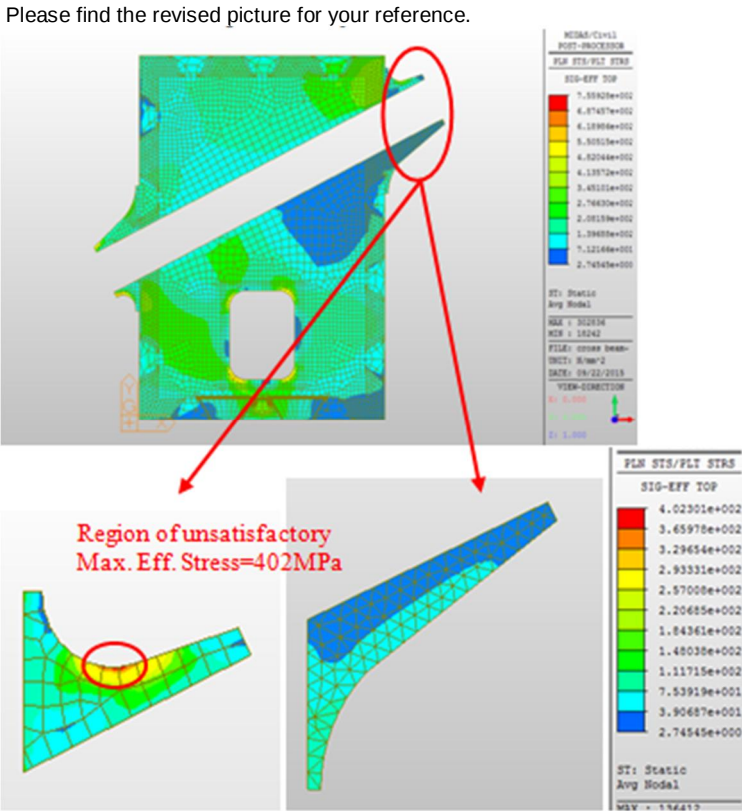
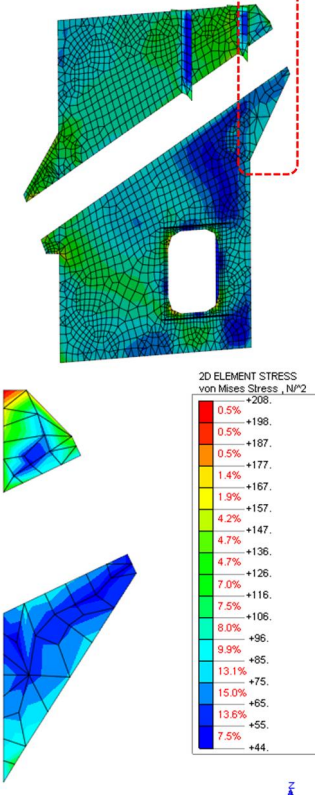
1)Category : Cat A = Agreed with response, Cat 0 = Observation / Note Cat 1 = Minor Comment Cat 2 = Major Comment / To be resolved
2)Comment Rev. : 1st comment, 2nd comment ...

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4.2	A2	3 rd	Please find the revised picture for your reference.  The maximal stress of 208 MPa was observed at top right corner as figure below, which is less than material strength applied with resistance factor. 	2
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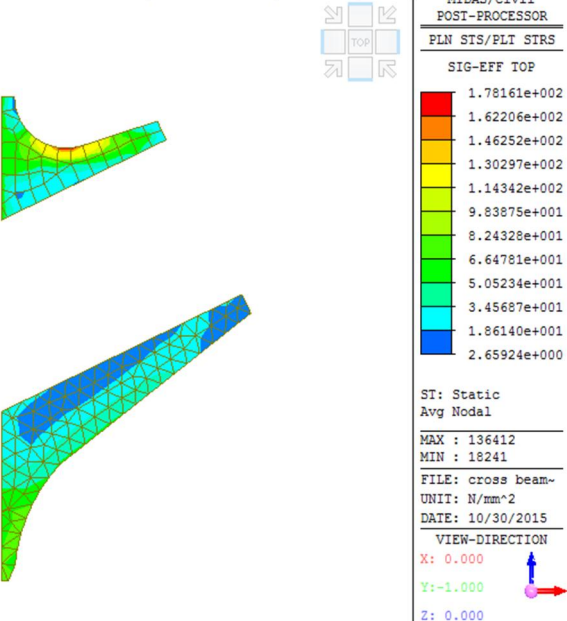
¹)Category : Cat A = Agreed with response, Cat 0 = Observation / Note Cat 1 = Minor Comment Cat 2 = Major Comment / To be resolved
²)Comment Rev. : 1st comment, 2nd comment ...

Verified by: 

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A3	4 th	By solely increasing the thickness of stiffeners from 20 to 30mm in the revised model, the concentrated stress at the curved edge reduced significantly. Therefore no further comments.  Curved Edge (Max von-Mises Stress=178MPa<345MPa OK)	Noted.	A
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1)Category : Cat A = Agreed with response, Cat 0 = Observation / Note Cat 1 = Minor Comment Cat 2 = Major Comment / To be resolved
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4.3	A2	2 nd	3. The modeled effective stress distribution of the diaphragm near access hole shown below suggests that the maximum effective stress exceeds 345MPa. Please clarify. MIDAS/Civil POST-PROCESSOR PLN SIS/PLT STS SIG-EFF BOTH SIDE 7.82512e+002 7.11546e+002 6.40579e+002 5.69612e+002 4.98645e+002 4.27679e+002 3.56712e+002 2.85745e+002 2.14778e+002 1.43812e+002 7.28449e+001 1.87812e+000 ST: Static ELEMENT MAX : 15414 MIN : 91571 FILE: cross beam- UNIT: N/mm^2 DATE: 08/10/2015 VIEW-DIRECTION X: 0.000 Y: 0.000 Z: 1.000
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For this case, the average stresses in the plate seem to be effectively above the admissible limit (between 300 and 500MPa). Are the two horizontal stiffeners of the manhole modeled?

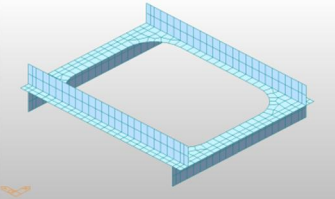
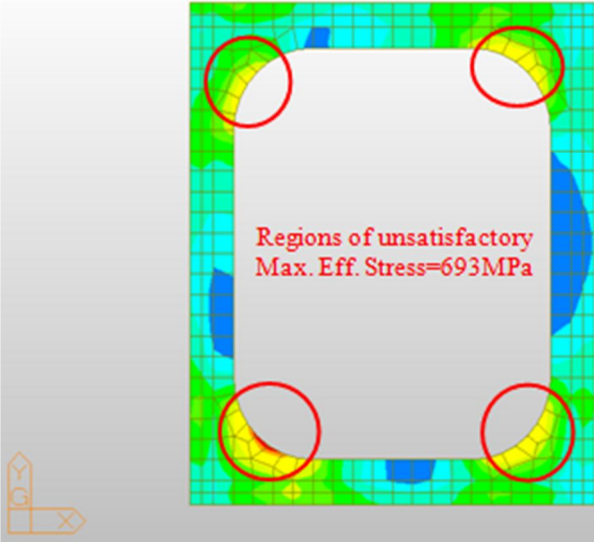
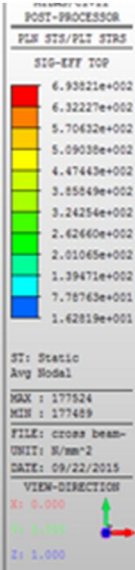
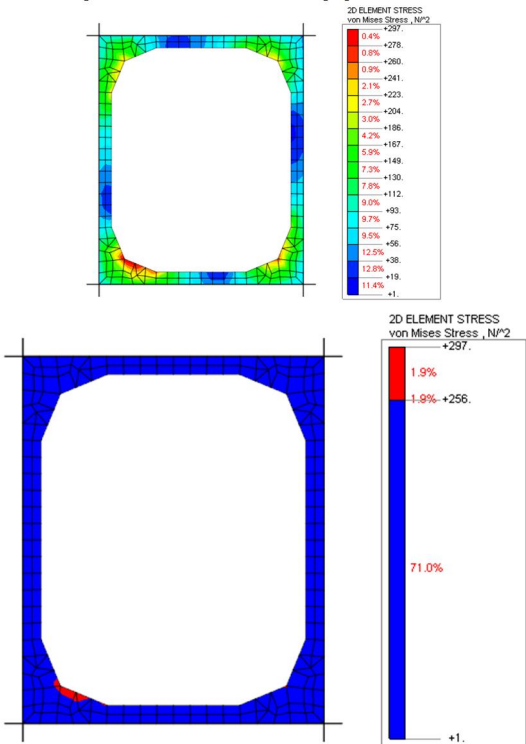
1)Category : Cat A = Agreed with response, Cat 0 = Observation / Note Cat 1 = Minor Comment Cat 2 = Major Comment / To be resolved
2)Comment Rev. : 1st comment, 2nd comment ...

Verified by:

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4.3	A2	3 rd	The four stiffeners are properly modeled. Please find the revised picture for your reference.   	The stress in corner edge of access hole exceeds the material strength. The stress beyond the material strength however was observed in very local area, thus it is thought the value could be negligible. 	2
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²⁾Comment Rev. : 1st comment, 2nd comment ...

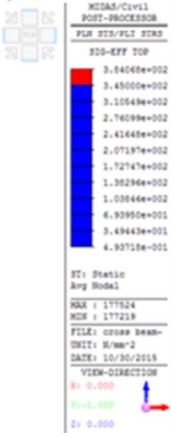
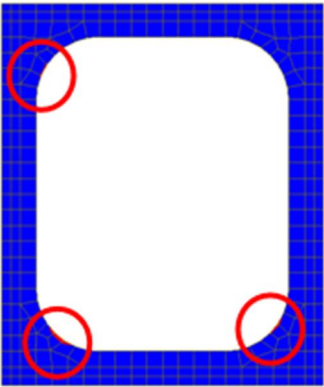
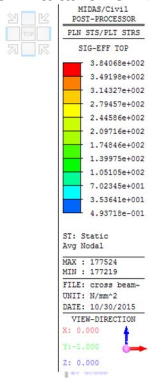
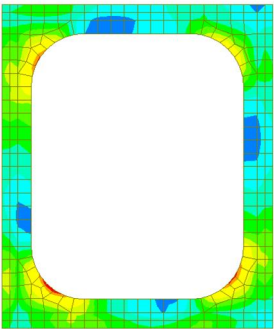
Verified by: 

ICE Check Report – List of Comments or Non-conformances

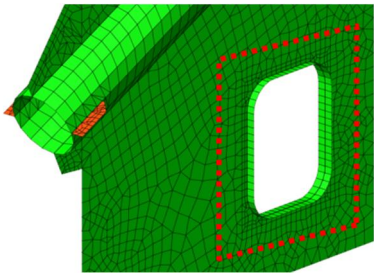
Document No : RA140-22-BRG-CW-DW-34470-A4-ICE3IC

Ref.Transmittal No	: TRS-1739
Ref. Report No & DWG package No	: RA140-22-BRG-CW-DW-34470-A4
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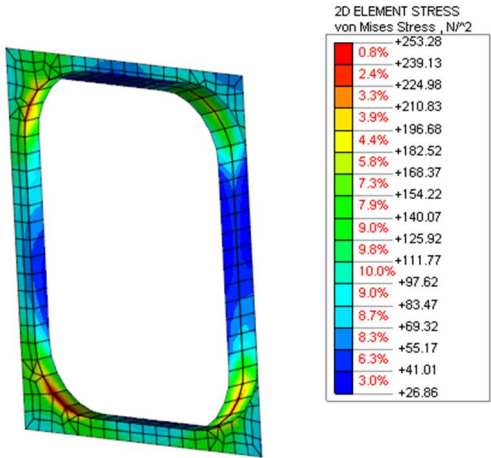
The updated model indicated that there is an excessive von-Mises stress. Please verify.
Max von-Mises Stress=384MPa>345MPa at lower left curved edge not OK



The stiffener for access opening was revised as shown below. The stiffener width is 120mm, and the thickness is 30mm.



FEA results indicate that after changing stiffener, Max. Von-Mises stress was reduced to 253.28 MPa.



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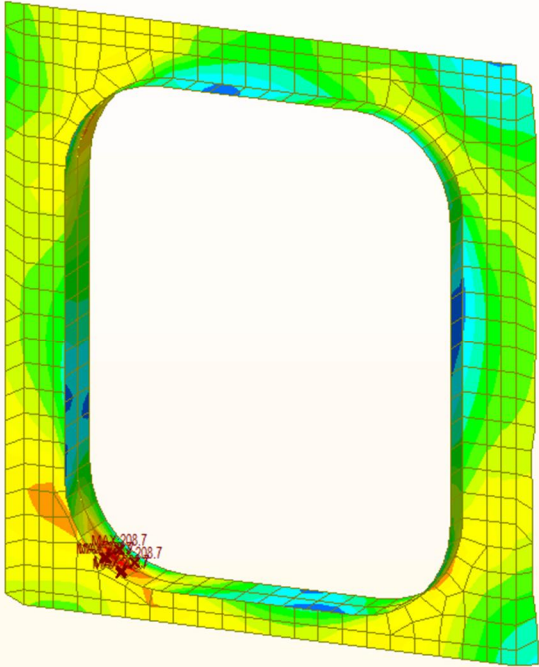
2)Comment Rev. : 1st comment, 2nd comment ...

Verified by:

ICE Check Report – List of Comments or Non-conformances

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A4	5 th	No further comments. Max von-Mises Stress=209MPa<345MPa OK .  PLN STS/PLT STRS SIG-EFF TOP 2.08750e+002 1.90397e+002 1.72044e+002 1.53691e+002 1.35339e+002 1.16986e+002 9.86332e+001 8.02805e+001 6.19278e+001 4.35751e+001 2.52224e+001 6.86965e+000 ST: Static Avg Nodal MAX : 567226 MIN : 567244 FILE: cross beam- UNIT: N/mm² DATE: 11/20/2015 VIEW-DIRECTION X: 0.383 Y:-0.879	A
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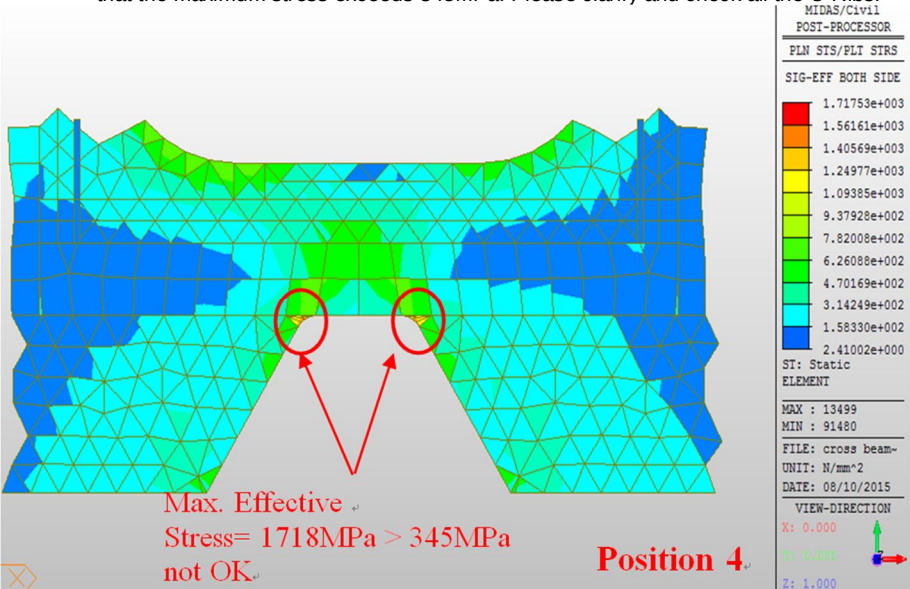
1)Category : Cat A = Agreed with response, Cat 0 = Observation / Note Cat 1 = Minor Comment Cat 2 = Major Comment / To be resolved
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4.4	A2	2 nd	4. The modeled effective stress distribution of the diaphragm near U-Ribs shown below suggests that the maximum stress exceeds 345MPa. Please clarify and check all the U-Ribs.  Max. Effective Stress= 1718MPa > 345MPa not OK Position 4	In FEM modelling, triangle meshing is to be avoided as much as possible, and it's considered that the proportions between two sides of an element should never exceed a factor 2 (meaning one side of a triangle should be no more than two times the length of another side). The problematic elements are made of three nearly flat triangles. To be able to compare our results and see if plate thicknesses increase are necessary, could you please show us the results when you exclude those elements so we can see the average stresses in the diaphragm between the U-rib stiffener and the manhole?	2
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2)Comment Rev. : 1st comment, 2nd comment ...

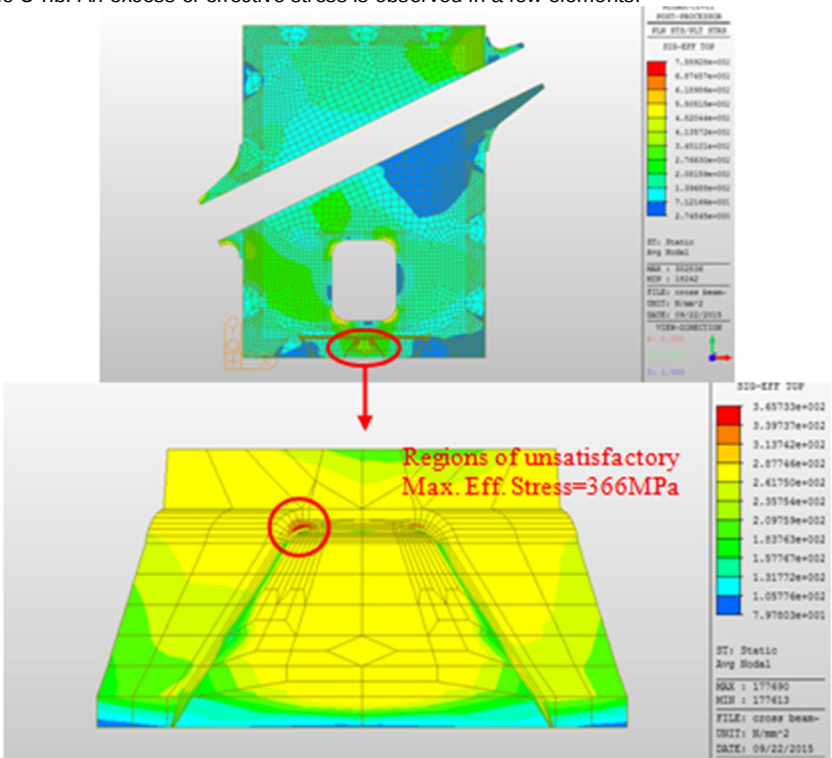
Verified by: 

ICE Check Report – List of Comments or Non-conformances

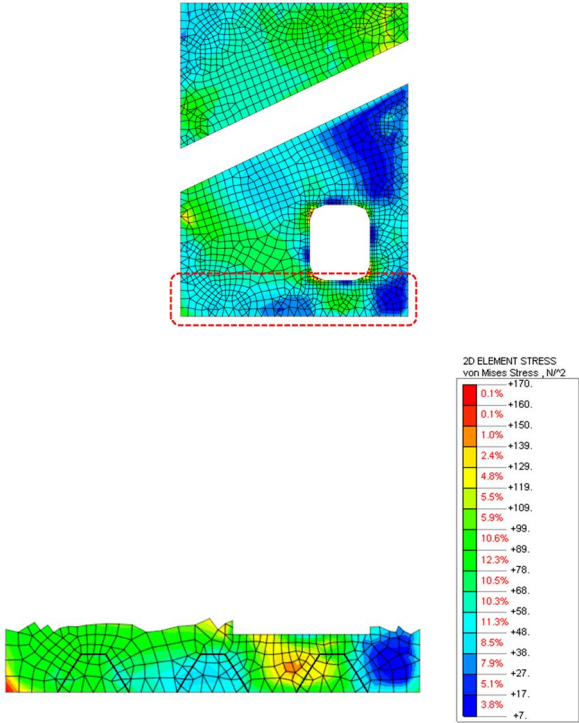
Document No : RA140-22-BRG-CW-DW-34470-A4-ICE3IC

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Quadrilateral elements are adopted in a much larger extent at this particular region, especially at the corner of the U-rib. An excess of effective stress is observed in a few elements.



The maximal stress of 170 MPa was observed at the interface with U-rib as figure below, which is less than material strength applied with resistance factor.



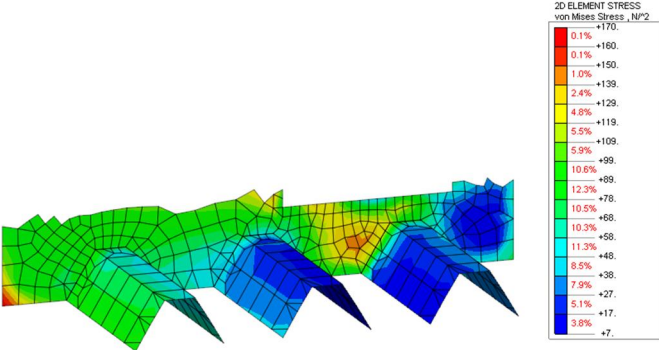
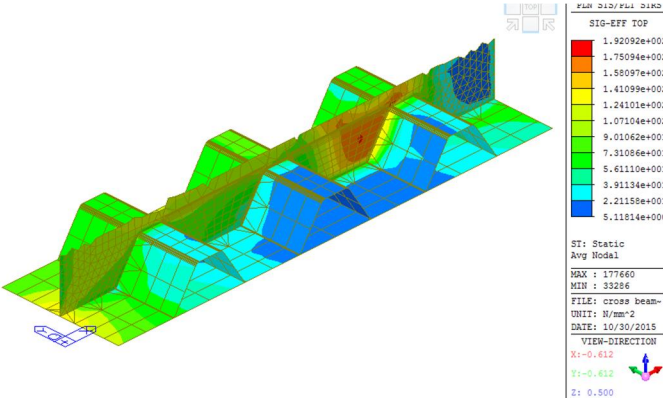
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A3		4 th	No further comments. Max von-Mises Stress=192MPa<345MPa OK		Noted.	A

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5	A2	DW-34485~34491	3 rd	There are different dimensions of anchorage details between coordinates table (DW-34653) and cross-beam section E'-E' drawing. Please clarify. ex) - DW-34653 Deck - Stay Cable Coordinates Stay Cable : CW-1 <table><tr><td></td><td>DWP-1</td><td>DWP-2</td><td>(DWP-2)-(DWP-1)</td></tr><tr><td>x</td><td>524.860</td><td>526.850</td><td>1.990</td></tr><tr><td>y</td><td>29.364</td><td>30.296</td><td>0.932</td></tr><tr><td>z</td><td>-1.150</td><td>-1.150</td><td>0.000</td></tr></table> Stay Cable : CW-1 <table><tr><td></td><td>DWP-2</td><td>DWP-3</td><td>(DWP-2)-(DWP-1)</td></tr><tr><td>x</td><td>526.850</td><td>528.573</td><td>1.723</td></tr><tr><td>y</td><td>30.296</td><td>31.103</td><td>0.807</td></tr><tr><td>z</td><td>-1.150</td><td>-1.150</td><td>0.000</td></tr></table> Stay Cable : CW-2 <table><tr><td></td><td>DWP-1</td><td>DWP-2</td><td>(DWP-2)-(DWP-1)</td></tr><tr><td>x</td><td>544.860</td><td>546.850</td><td>1.990</td></tr><tr><td>y</td><td>29.422</td><td>30.359</td><td>0.937</td></tr><tr><td>z</td><td>-1.150</td><td>-1.150</td><td>0.000</td></tr></table> Stay Cable : CW-2 <table><tr><td></td><td>DWP-2</td><td>DWP-3</td><td>(DWP-2)-(DWP-1)</td></tr><tr><td>x</td><td>546.850</td><td>548.840</td><td>1.990</td></tr><tr><td>y</td><td>30.359</td><td>31.297</td><td>0.938</td></tr><tr><td>z</td><td>-1.150</td><td>-1.150</td><td>0.000</td></tr></table> Stay Cable : CW-3 <table><tr><td></td><td>DWP-1</td><td>DWP-2</td><td>(DWP-2)-(DWP-1)</td></tr><tr><td>x</td><td>564.860</td><td>566.850</td><td>1.990</td></tr><tr><td>y</td><td>29.460</td><td>30.403</td><td>0.943</td></tr><tr><td>z</td><td>-1.150</td><td>-1.150</td><td>0.000</td></tr></table> Stay Cable : CW-2 <table><tr><td></td><td>DWP-2</td><td>DWP-3</td><td>(DWP-2)-(DWP-1)</td></tr><tr><td>x</td><td>566.850</td><td>568.836</td><td>1.986</td></tr><tr><td>y</td><td>30.403</td><td>31.344</td><td>0.941</td></tr><tr><td>z</td><td>-1.150</td><td>-1.150</td><td>0.000</td></tr></table>		DWP-1	DWP-2	(DWP-2)-(DWP-1)	x	524.860	526.850	1.990	y	29.364	30.296	0.932	z	-1.150	-1.150	0.000		DWP-2	DWP-3	(DWP-2)-(DWP-1)	x	526.850	528.573	1.723	y	30.296	31.103	0.807	z	-1.150	-1.150	0.000		DWP-1	DWP-2	(DWP-2)-(DWP-1)	x	544.860	546.850	1.990	y	29.422	30.359	0.937	z	-1.150	-1.150	0.000		DWP-2	DWP-3	(DWP-2)-(DWP-1)	x	546.850	548.840	1.990	y	30.359	31.297	0.938	z	-1.150	-1.150	0.000		DWP-1	DWP-2	(DWP-2)-(DWP-1)	x	564.860	566.850	1.990	y	29.460	30.403	0.943	z	-1.150	-1.150	0.000		DWP-2	DWP-3	(DWP-2)-(DWP-1)	x	566.850	568.836	1.986	y	30.403	31.344	0.941	z	-1.150	-1.150	0.000	The coordinates table in DW-34653 is correct. The table in the crossbeam drawing package will be corrected in revision.	2
	DWP-1	DWP-2	(DWP-2)-(DWP-1)																																																																																																			
x	524.860	526.850	1.990																																																																																																			
y	29.364	30.296	0.932																																																																																																			
z	-1.150	-1.150	0.000																																																																																																			
	DWP-2	DWP-3	(DWP-2)-(DWP-1)																																																																																																			
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z	-1.150	-1.150	0.000																																																																																																			
	DWP-2	DWP-3	(DWP-2)-(DWP-1)																																																																																																			
x	546.850	548.840	1.990																																																																																																			
y	30.359	31.297	0.938																																																																																																			
z	-1.150	-1.150	0.000																																																																																																			
	DWP-1	DWP-2	(DWP-2)-(DWP-1)																																																																																																			
x	564.860	566.850	1.990																																																																																																			
y	29.460	30.403	0.943																																																																																																			
z	-1.150	-1.150	0.000																																																																																																			
	DWP-2	DWP-3	(DWP-2)-(DWP-1)																																																																																																			
x	566.850	568.836	1.986																																																																																																			
y	30.403	31.344	0.941																																																																																																			
z	-1.150	-1.150	0.000																																																																																																			

¹⁾Category : Cat A = Agreed with response, Cat 0 = Observation / Note Cat 1 = Minor Comment Cat 2 = Major Comment / To be resolved

²⁾Comment Rev. : 1st comment, 2nd comment ...

Verified by:

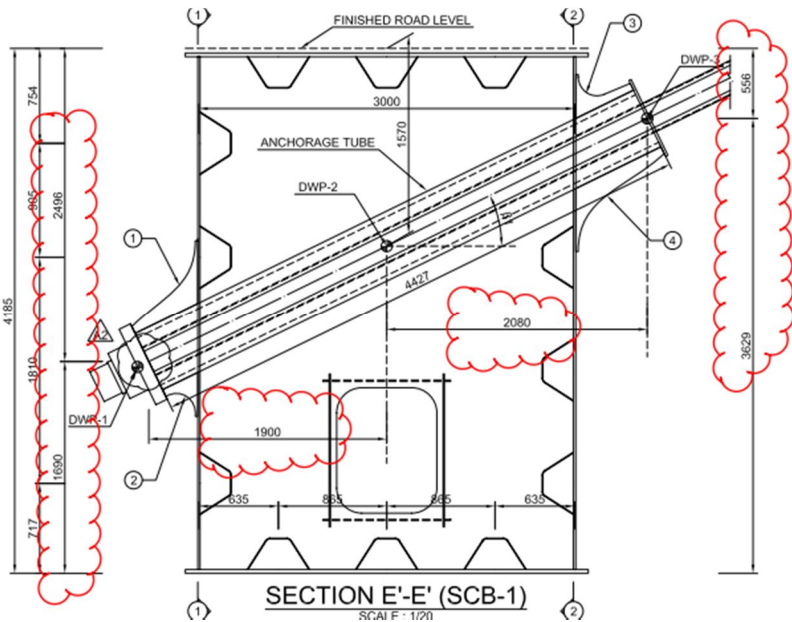


ICE Check Report – List of Comments or Non-conformances

Document No : RA140-22-BRG-CW-DW-34470-A4-ICE3IC

Ref.Transmittal No	: TRS-1739
Ref. Report No & DWG package No	: RA140-22-BRG-CW-DW-34470-A4
Document title	: Detailed Design –Main Bridge - Steel Cross Beam Drawing Package A4
Comments Issued by & date	: by Dr. Yu, Guoxiong on 30 th July 2015, 28 th Aug 2015, 22 th September 2015, 03 rd November 2015, 20 th November 2015
Answer Issued by & date	:
Consent Classification	: A (A: No adverse comments / B: Agree in Principle with minor comments / C: Insufficient Information to proceed with review / W: Major Non-conformity found, revision required)

- Steel cross beam Section E'-E' (SCB-1)



4th No further comments.

Noted.

A

¹)Category : Cat A = Agreed with response, Cat 0 = Observation / Note Cat 1 = Minor Comment Cat 2 = Major Comment / To be resolved
²)Comment Rev. : 1st comment, 2nd comment ...

Verified by: 

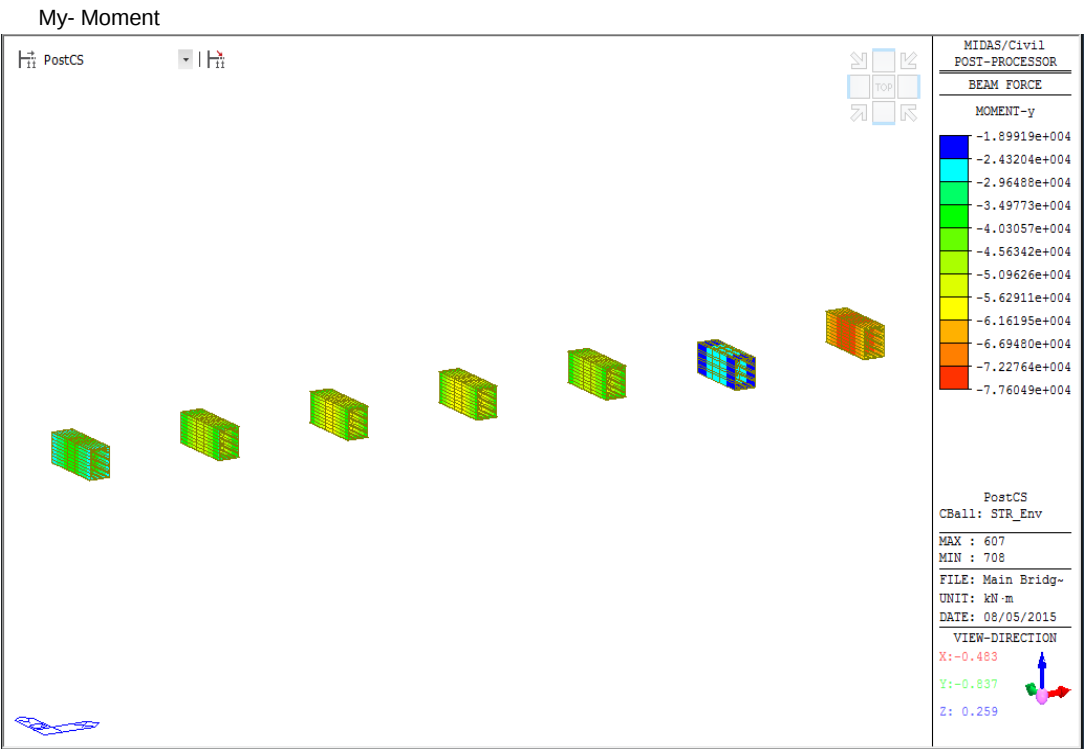
Appendix B

Approaches for Checking

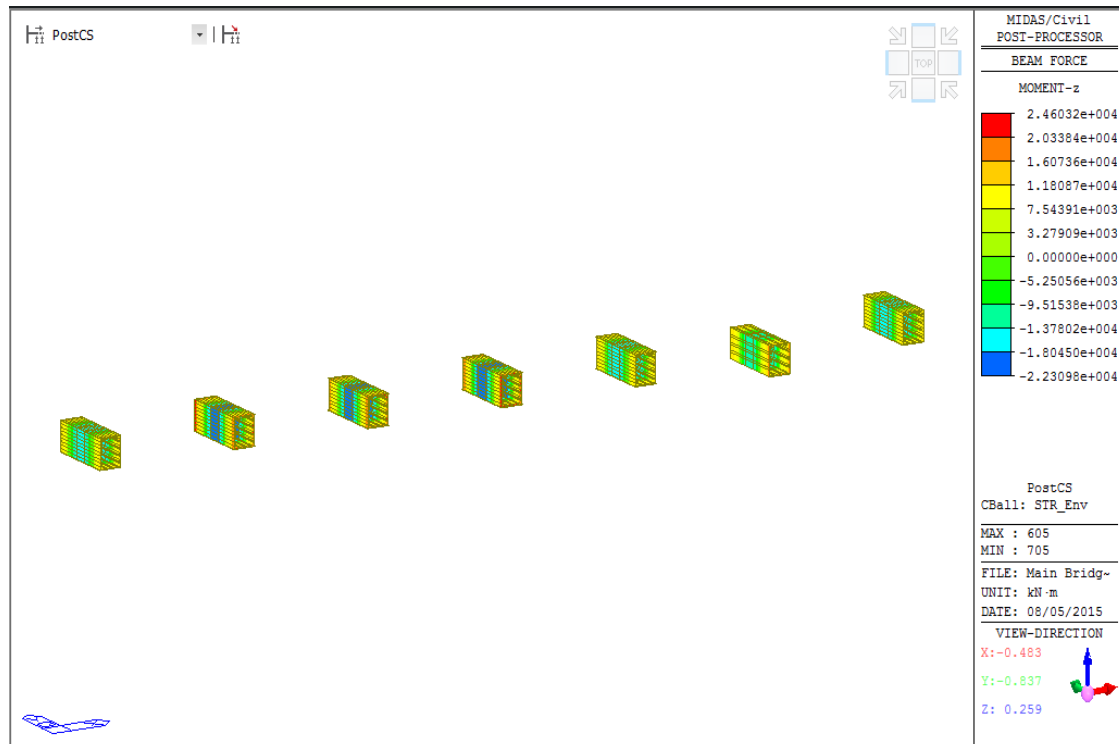
STEEL CROSS BEAM CHECK

1. Analysis Result

Elem	Load	Part	Axial (kN)	Shear-y (kN)	Shear-z (kN)	Torsion (kN·m)	Moment-y (kN·m)	Moment-z (kN·m)	
508	STR_Env(all)	I[508]	6709.4	-8454.4	-5127.2	14343.3	-77593.3	-17943.7	SCB-7
508	STR_Env(all)	J[31137]	6709.4	-8454.4	-4935.1	14343.3	-64277.5	17366.2	
608	STR_Env(all)	I[31138]	6709.4	8455.4	4893.7	-14710.2	-64143.8	17366.7	
608	STR_Env(all)	J[608]	6709.4	8455.4	5085.8	-14710.2	-77604.9	-17947.8	
708	STR_Env(all)	I[608]	6709.4	520.7	-1397.0	-10708.4	-77604.9	-17947.8	
708	STR_Env(all)	J[508]	6709.4	520.7	1355.4	-10708.4	-77593.3	-17943.7	



Mz- Moment

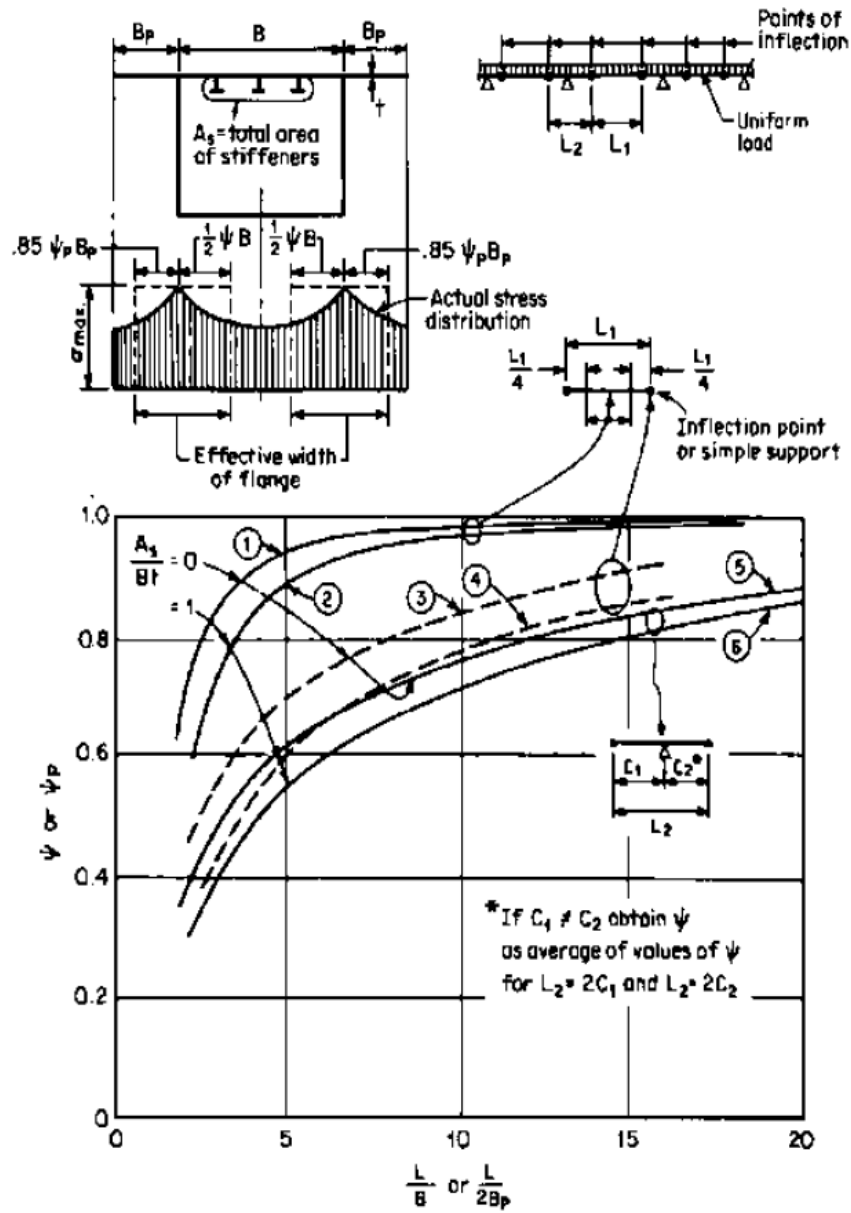


Sy- Moment



2. Effective width ratio of steel Cross Beam (artl.4.6.2.6.4)

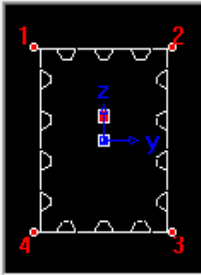
direction		equivalent span length		width		effective width of inner flange						application
span	section	+moment	-moment	outer width	inner width	positive moment		negative moment		positive moment	negative moment	
		L+(m)	L-(m)	B1(m)	B2(m)	L+/B2	$\Psi 2+$	L-/B2	$\Psi 2-$	$\Psi B2/2$	$\Psi B2/2$	
Cross Beam	1	5.12	5.12	-	3.00	1.71	0.60	1.71	0.30	0.90	0.45	
		5.12	5.12	-	4.12	1.24	0.60	1.24	0.30	1.24	0.62	



3. Section properties of cross Beam

direction	unit	type 1
Area	(m2)	0.403
Iz	(m4)	1.158
Iy	(m4)	0.576
Iy1	(m)	2.045
Iy1	(m)	2.045
Iz	(m)	1.609
Fy	(MPa)	345
E	(MPa)	200000
bf-deck	(mm)	3218
tf-deck	(mm)	30
bf-low fl	(mm)	3218
tf-low fl	(mm)	30
bw-outer web	(mm)	4089
tw-outer web	(mm)	18
bf-inclined fl	(mm)	0
tf-inclined fl	(mm)	0
Depth of gir.	(mm)	4149
w1	(mm)	300
w2	(mm)	300
n		5
Is(upper)	(mm4)	8.922E+07
Φf		1.00
Φc		0.90
Φv		1.00
K		1.00
Lz	(mm)	3000
Ly	(mm)	3000

Name: Steel_Cross Bear ☒ Built-Up Section

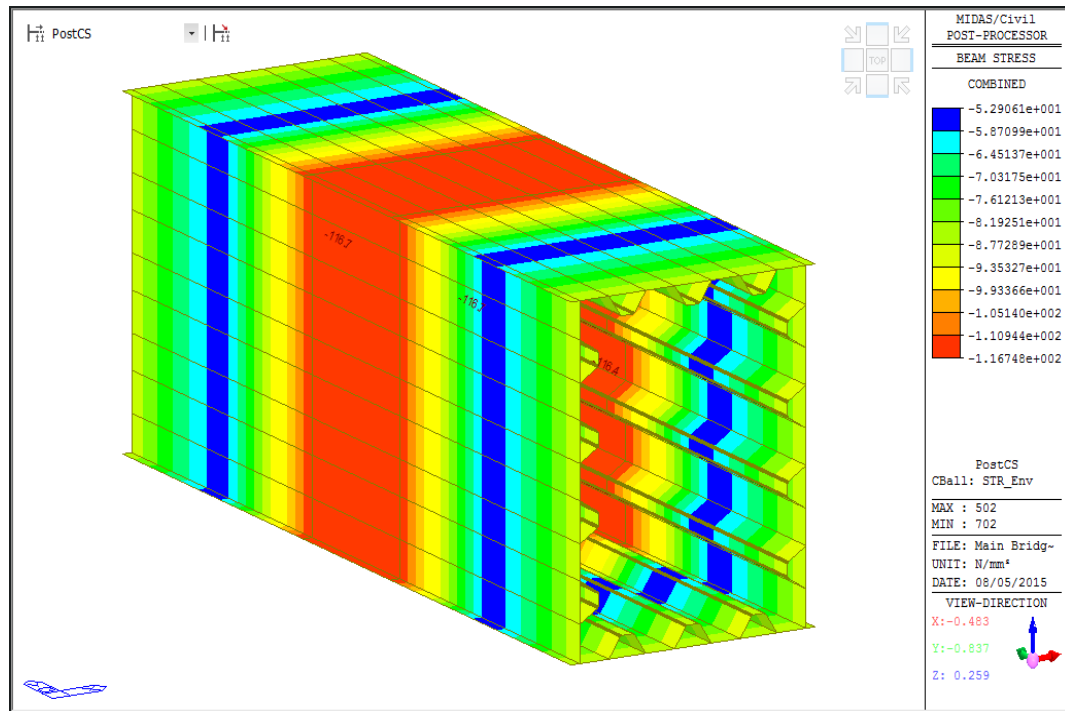
Import SEC Files...

Section Properties		
Area	4.02980e-001	m ²
Asy	1.45417e-001	m ²
Asz	1.48599e-001	m ²
Ixx	9.79247e-001	m ⁴
Iyy	1.15810e+000	m ⁴
Izz	5.76425e-001	m ⁴
Cyp	1.6090	m
Cym	1.6090	m
Czp	2.0745	m
Czm	2.0745	m
Qyb	8.7698	m ²
Qzb	3.0617	m ²
Peri:O	0.00000e+000	m
Peri:I	0.00000e+000	m
Cent:y	1.6090	m
Cent:z	2.0445	m
y1	-1.6090	m
z1	2.0445	m
y2	1.6090	m

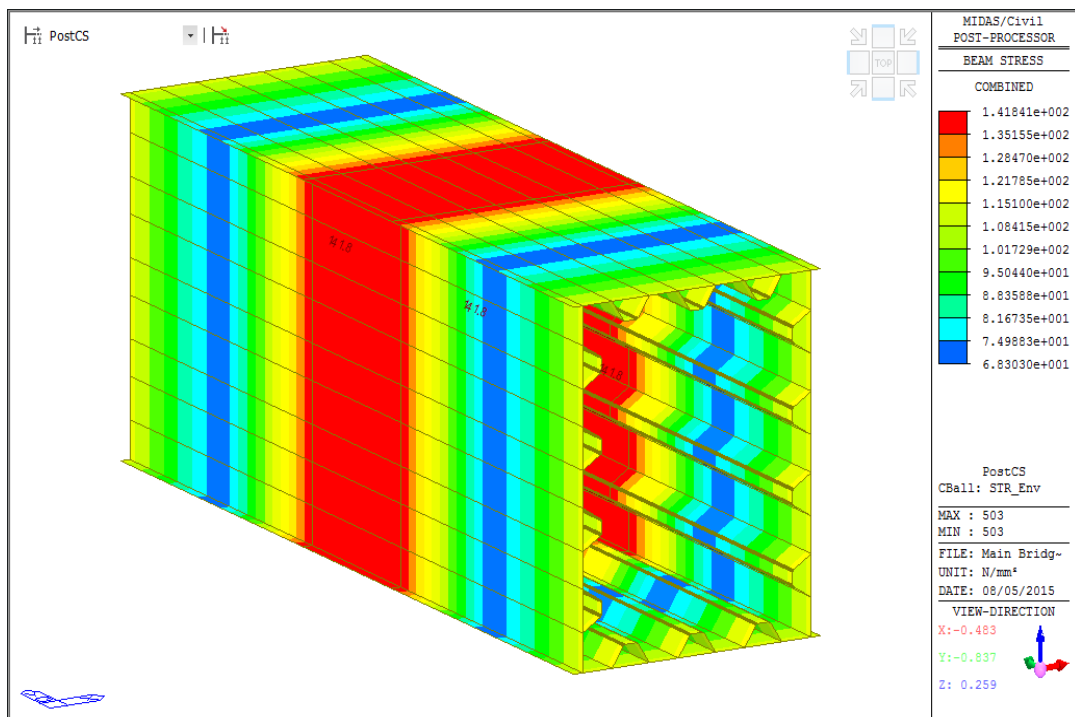
A(enclosed)	(mm ²)	8.724E+07
d0	(mm)	3000
b(flange)	(mm)	300
b(web)	(mm)	300
ds	(mm)	140
eff. ratio		1.000
bw-inner web	(mm)	0
tw-inner web	(mm)	0
ea-inner web	ea	0
2z-inner web	(m)	0.000
Is(lower)	(mm ⁴)	6.148E+07

5. Summary of Flexural Resistance

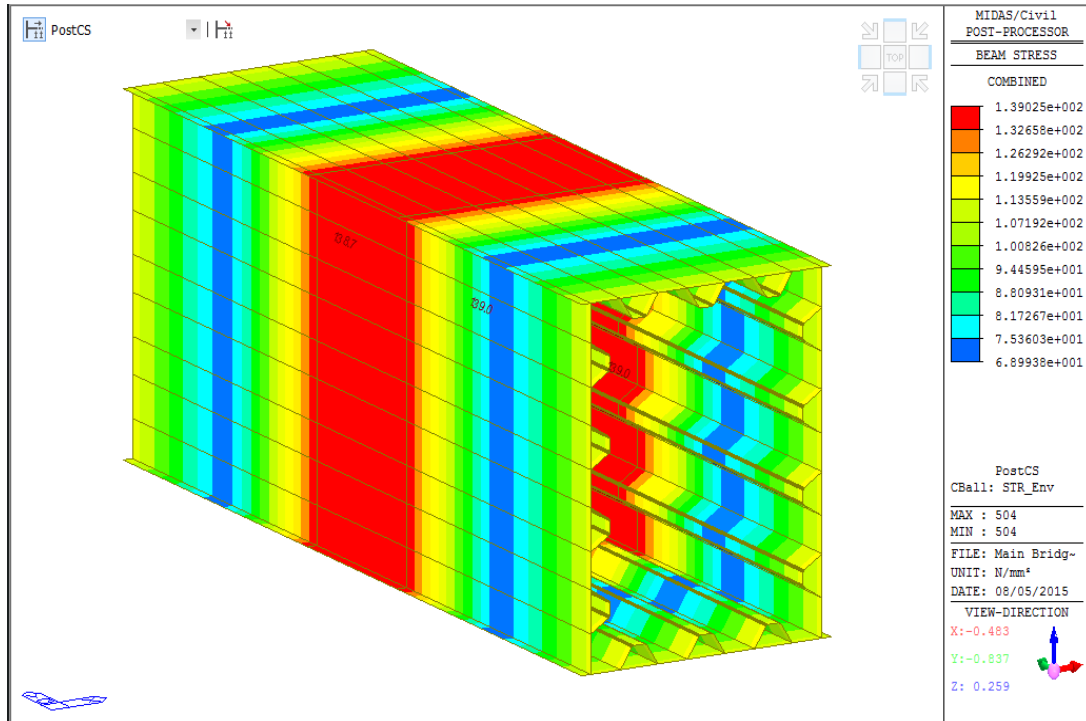
- Steel Cross Beam 01



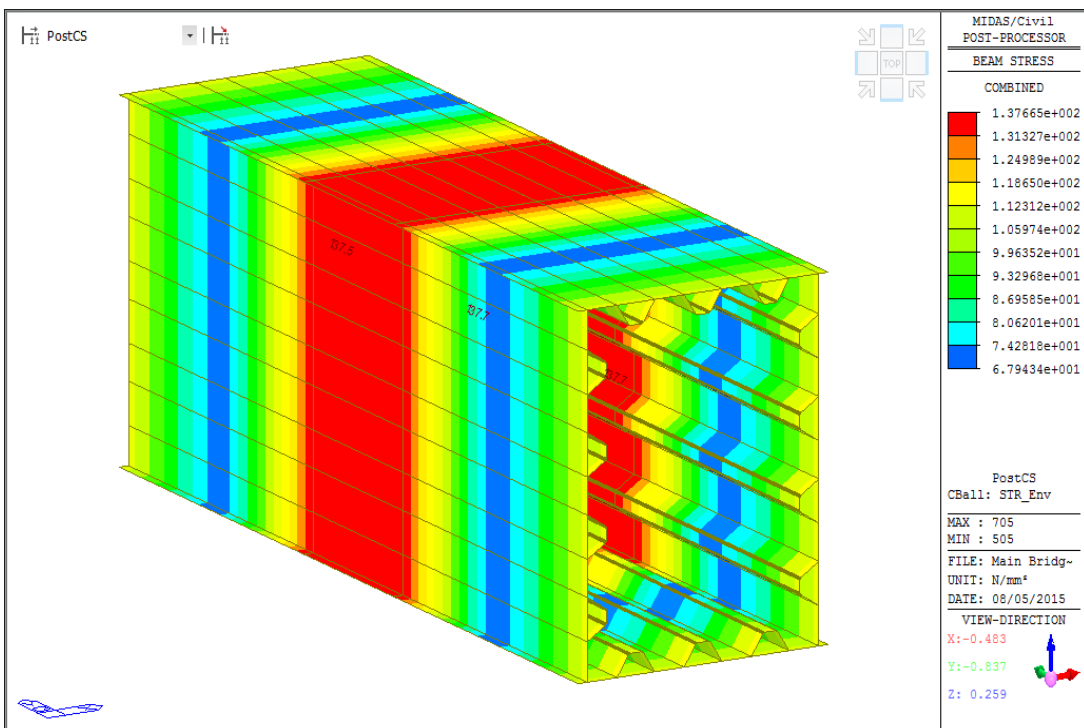
- Steel Cross Beam 02



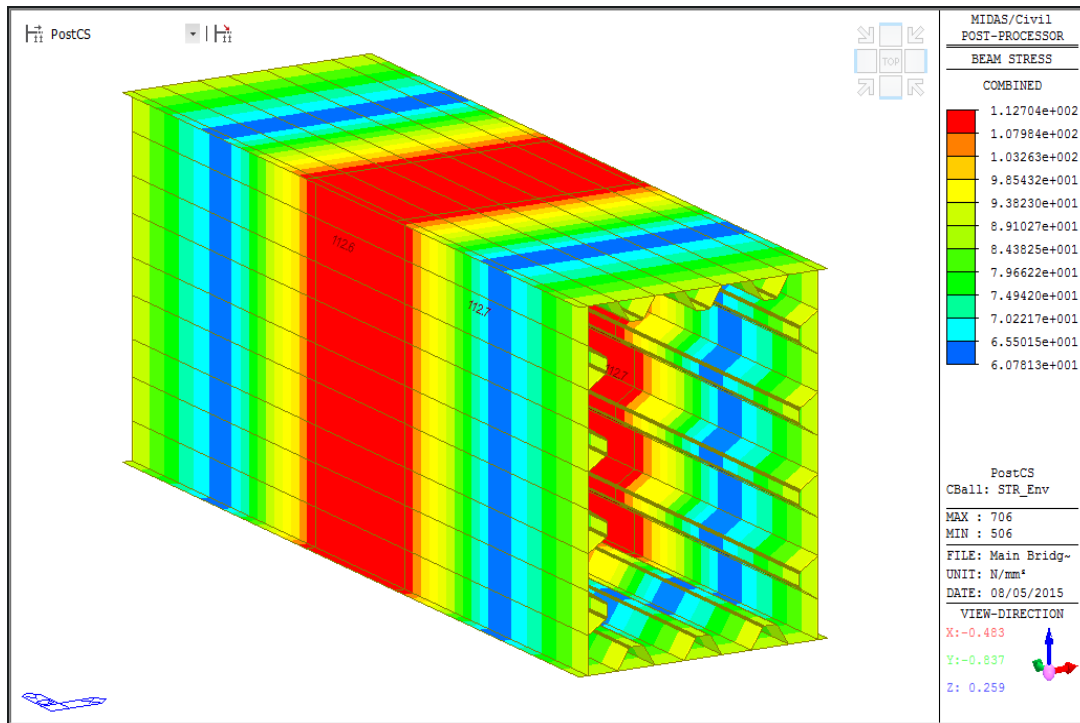
- Steel Cross Beam 03



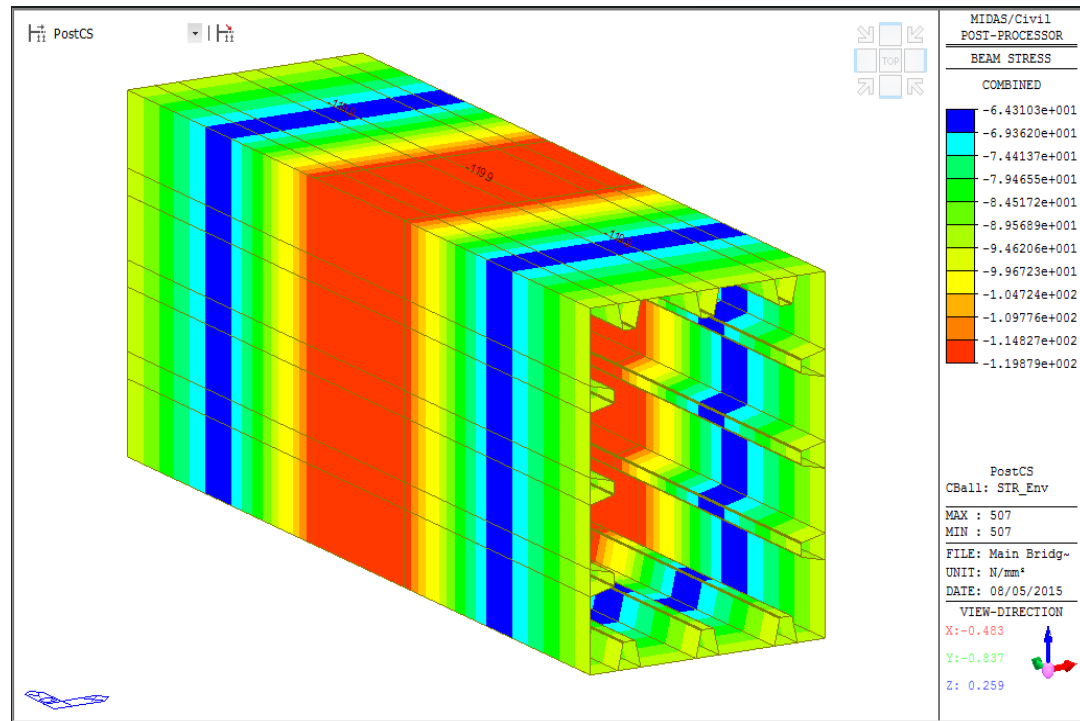
- Steel Cross Beam 04



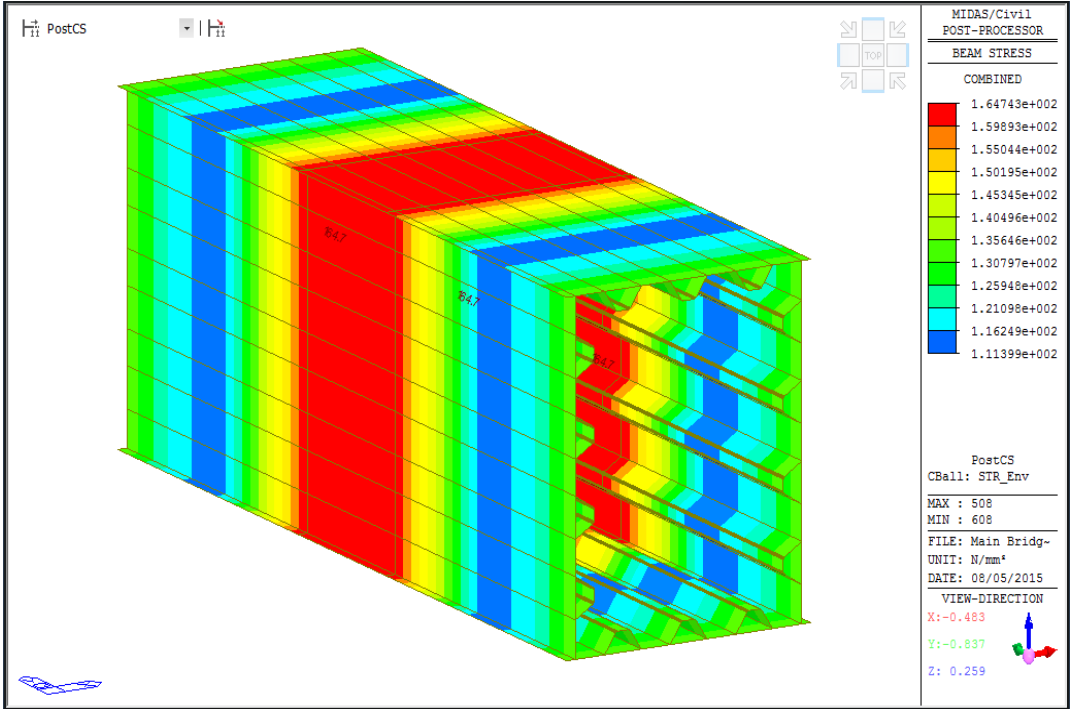
- Steel Cross Beam 05



- Steel Cross Beam 06



- Steel Cross Beam 07



Steel Cross Beam Check

1 Modelling of the cross beam

Figures 1 and 2 show the Midas model built for the cross beam checking. A cross beam of 10.2m long with six diaphragms and two cable anchors are constructed to study the effect of cable anchor on the cross beam structures.

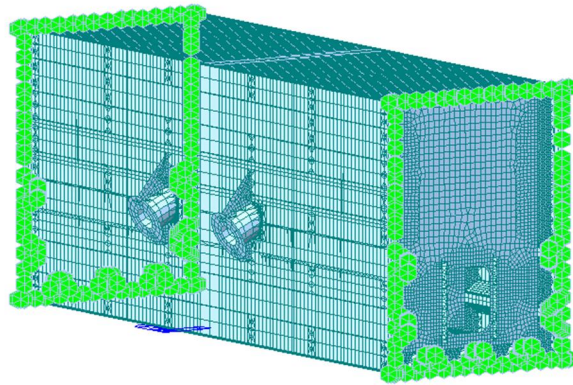


Figure 1: Global Model of the Cross Beam with Fixed Boundary Conditions at the Two Ends

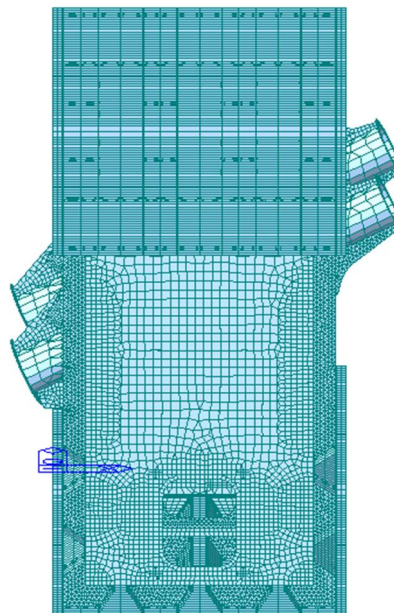


Figure 2: Interior Model of the Cross Beam

In particular, the capabilities of the diaphragms to resist cable forces are studied. As a result, the diaphragm and anchor are meshed carefully in detail for a static analysis, which is shown in Figure 3.

Note that the end plate and the two stiffener plates attached to the end plate are not modelled as described in the drawing package due to limited time of revising the model.

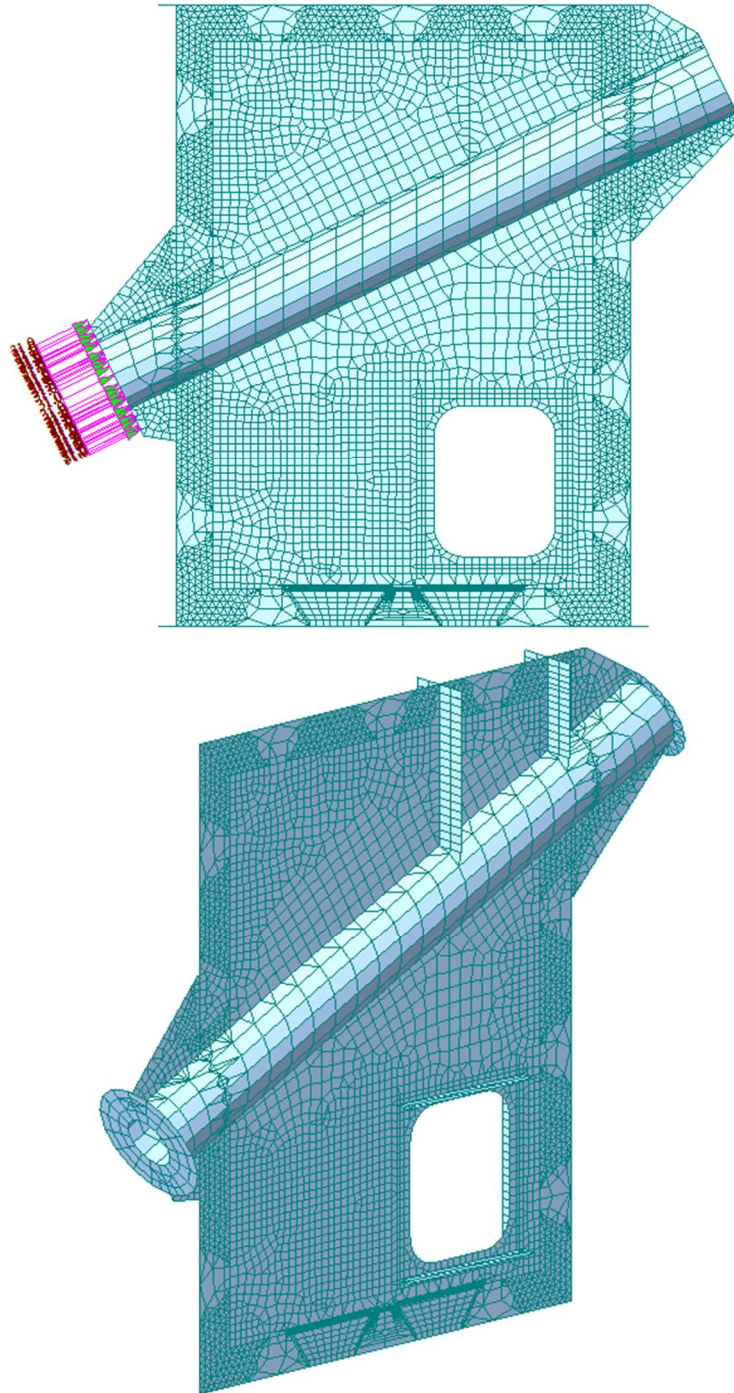


Figure 3: Diaphragm and Anchor Modeling with Applied Loading in Two Different Views

2 Analysis results

2.1 Diaphragm and Anchor

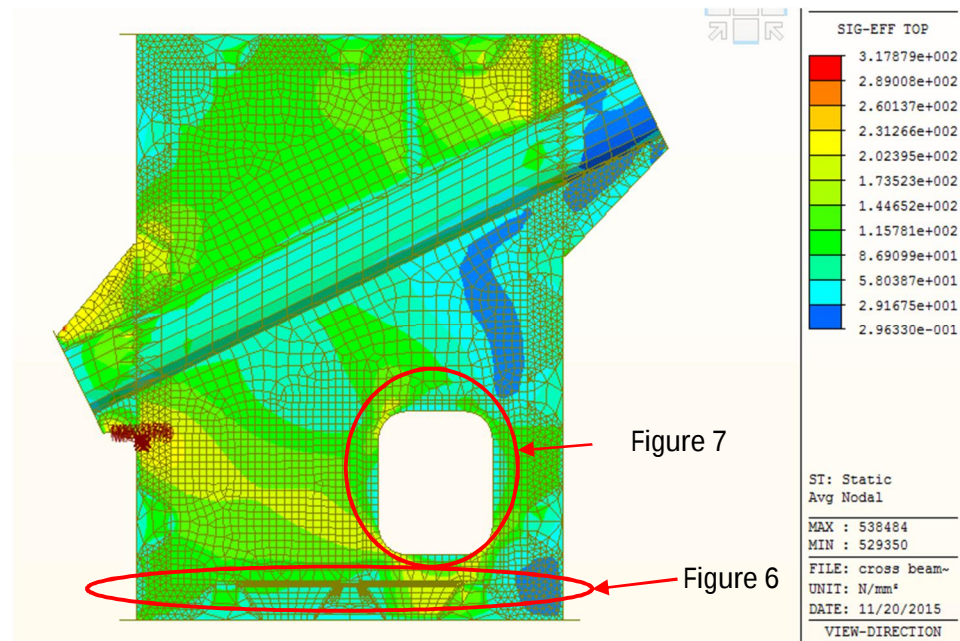


Figure 5: Effective Stress Distribution- Diaphragm and Anchor

Figure 5 shows the effective stresses of the diaphragm and anchor of steel cross beam. It can be observed that the simulated von-Mises stresses did not exceed the yield stress (345 N/mm^2) at the curved edges of access hole.

Detailed effective stress contours of the concerned areas are further depicted in Figure 6 and Figure 7.

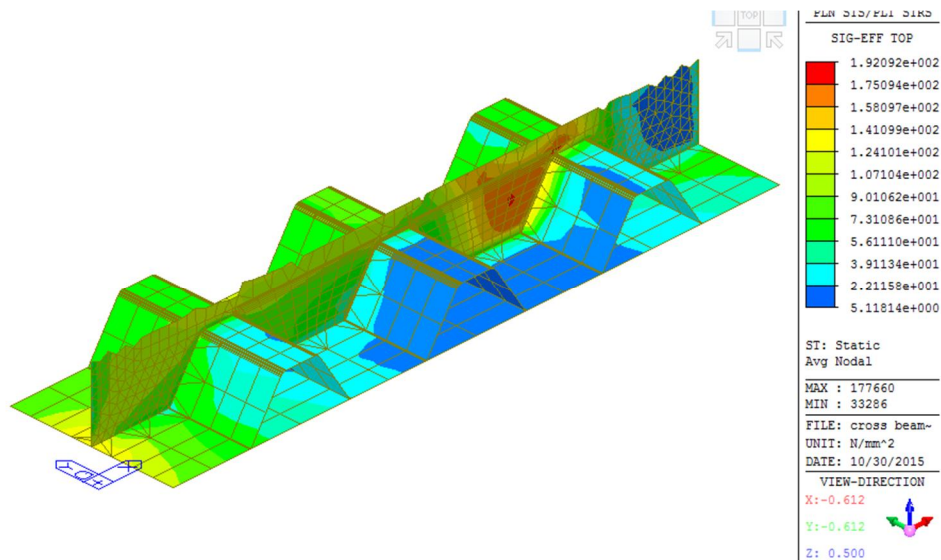


Figure 6: Effective Stress Distribution- Area near U-Rib

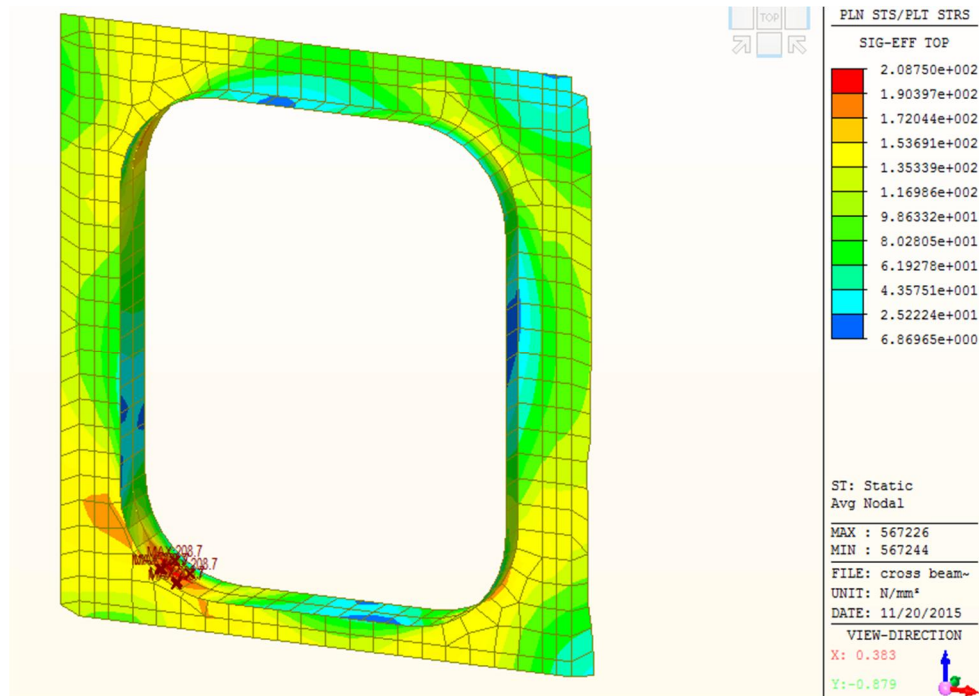


Figure 7: Effective Stress Distribution- Access Hole

2.2 Stiffeners

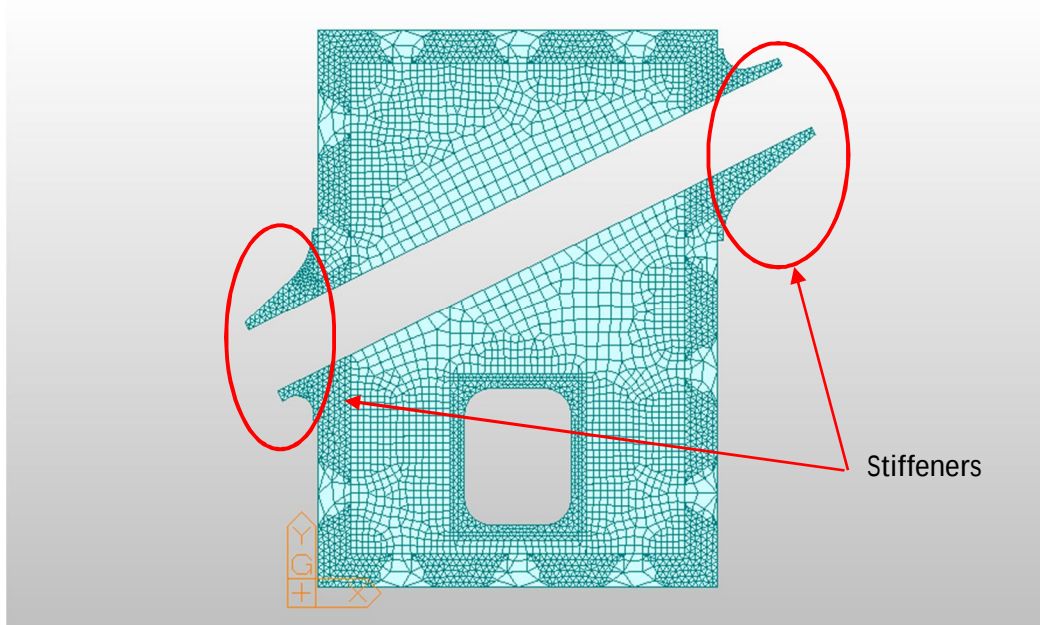


Figure 8: Modeling of Stiffeners

Figure 8 depicts the position of stiffeners attached to the anchor, and Figure 9 and 10 show the effective stress distributions of the stiffeners. It is observed again that the simulated von-Mises stresses of stiffener plates attached to bearing plate did not exceed the yield stress.

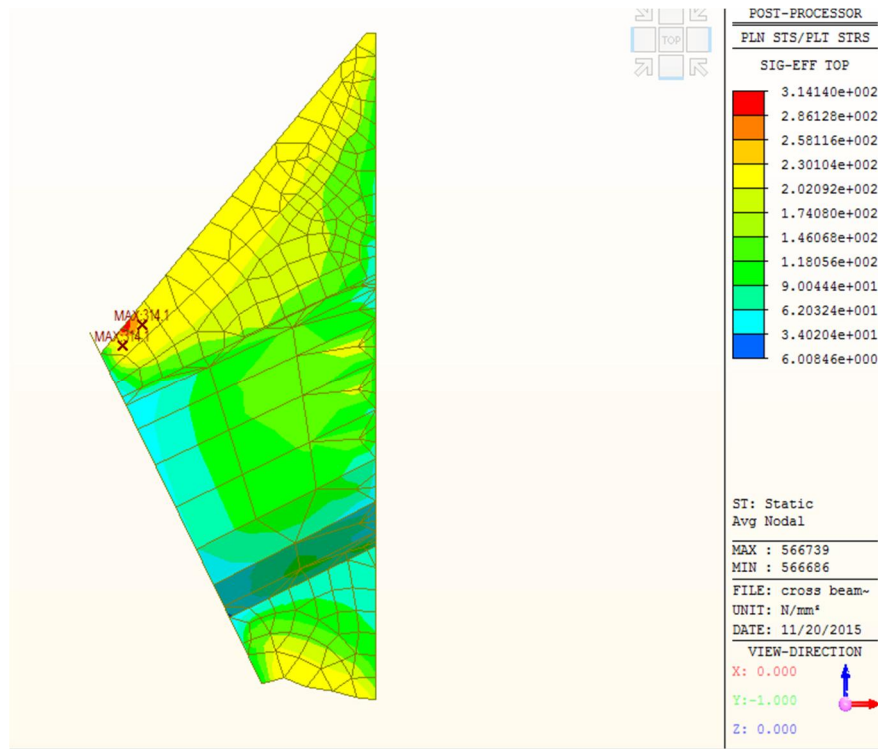


Figure 9 Effective Stress Distribution- Stiffeners (1)

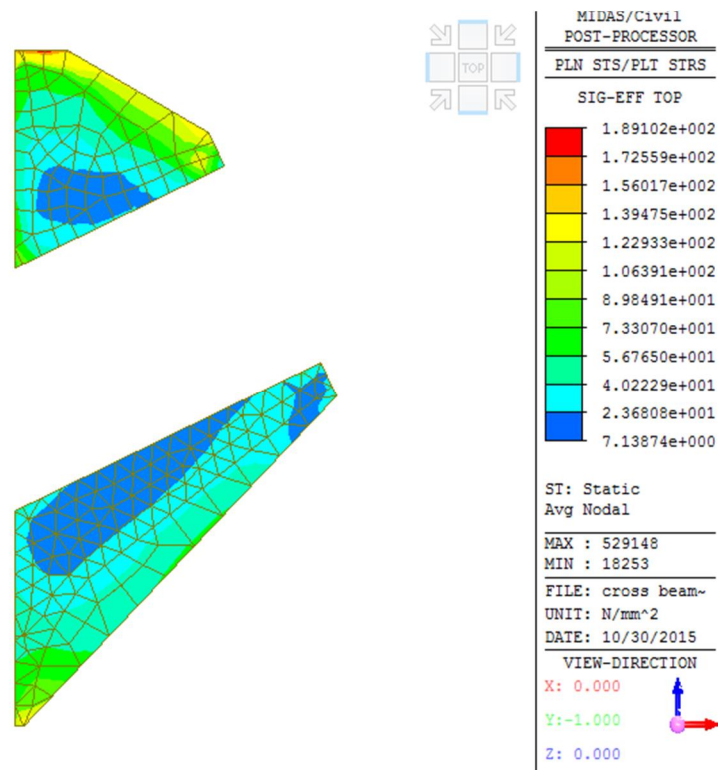


Figure 10 Effective Stress Distribution- Stiffeners (2)

2.3 Discussion

The global deformation, deformed diaphragm and access hole are shown in Figure 11 to 13. The maximum deformation simulated is about 8.5mm on the bearing plate. It can be noticed from Figure 9 that the effective stress transfers from the stiffener plate to the lower left corner of the access hole then to the left corner of the bottom central U-rib. As shown in figure 10, the deformation of the access hole results in tensile and compressive stresses at the corners.

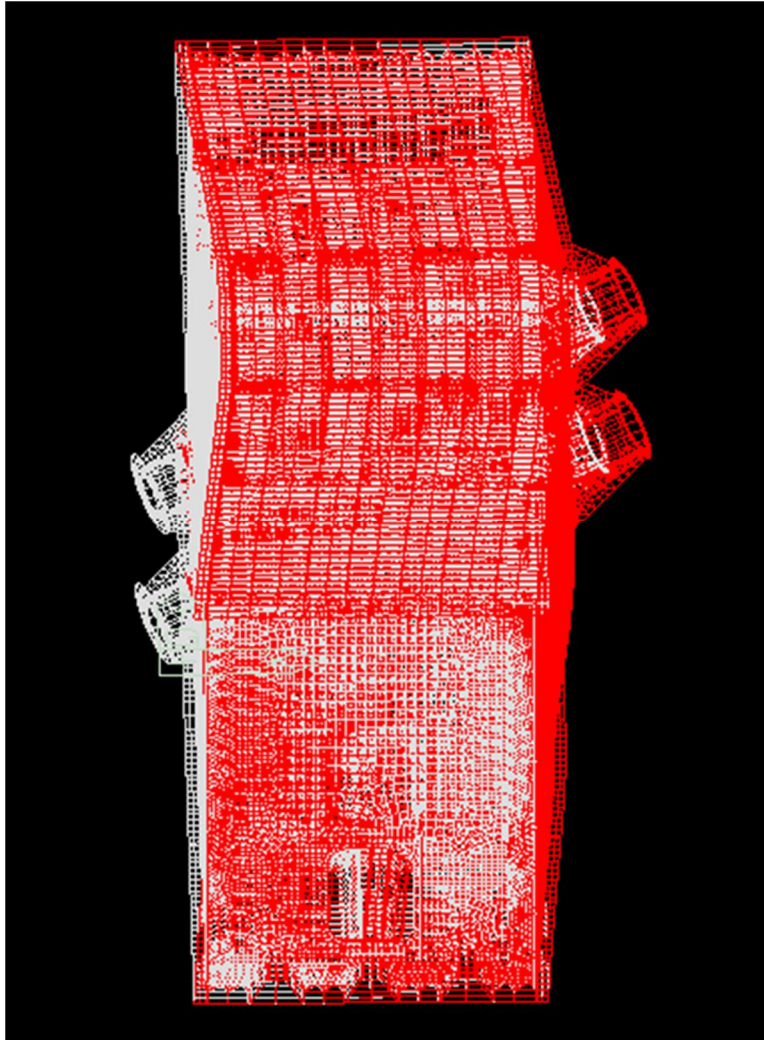


Figure 11: Global Deformation Pattern (grey-undeformed; red-deformed)

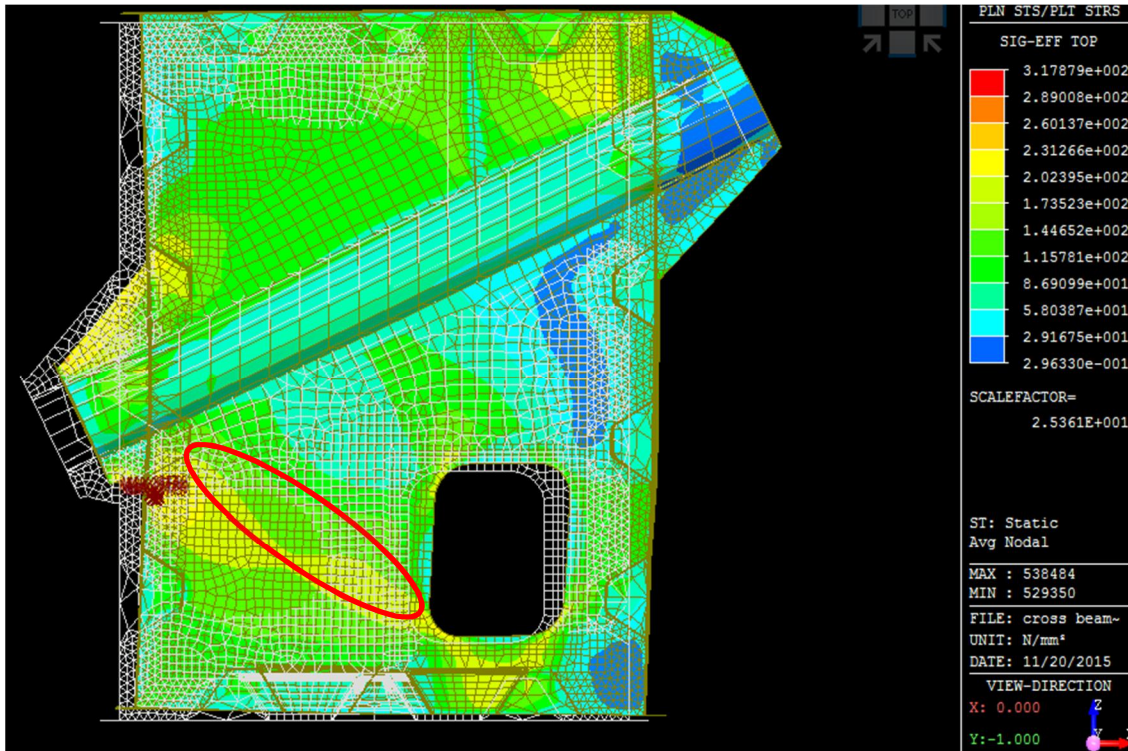


Figure 12: Deformation Pattern- Diaphragm

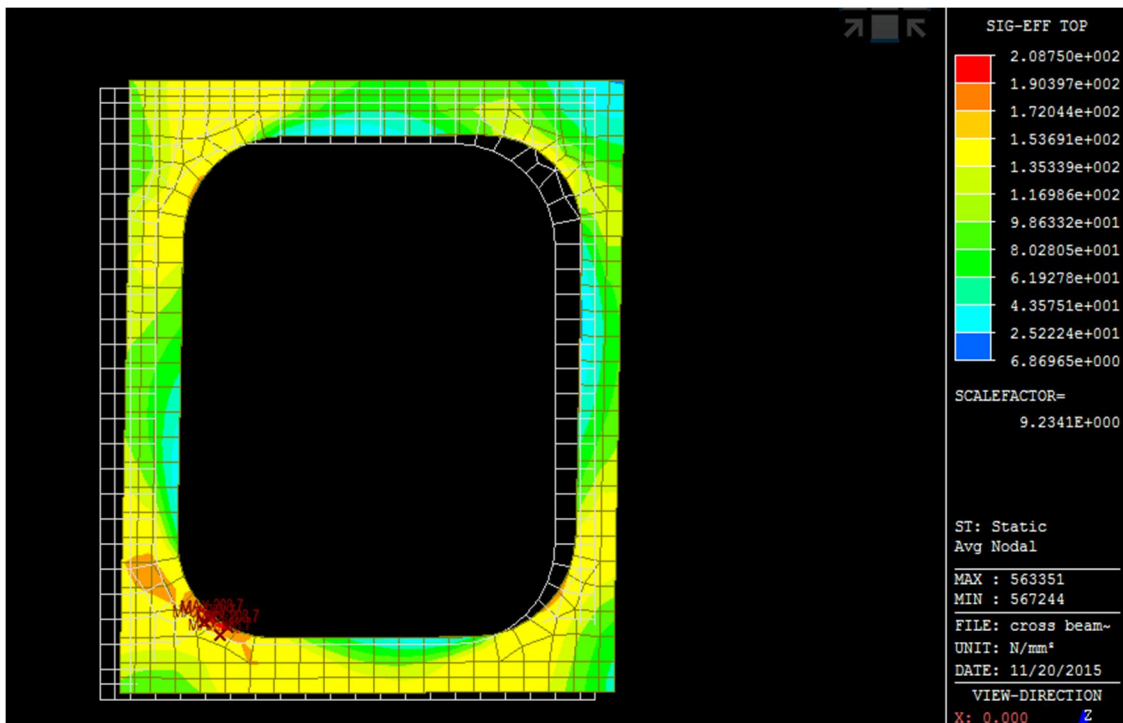


Figure 13: Deformation Pattern-Access Hole

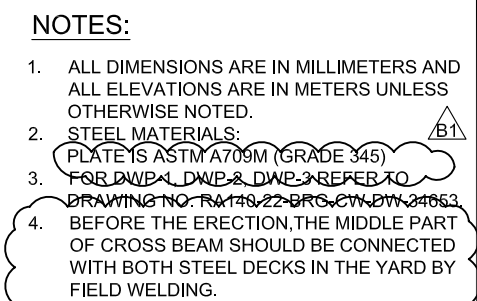
Sheikh Jaber Al-Ahmad Al-Sabah Causeway Project
Main Link – Contract RA/140



DETAILED DESIGN –MAIN BRIDGE
STEEL CROSS BEAM DRAWING PACKAGE

Drawing package No.: RA140-22-BRG-CW-DW-34470-B1

Code	Revision	Date	Title 1	Title 2	Title 3	Comment
RA140-22-BRG-CW-DW-34471	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	GENERALLAYOUT 1/2	
RA140-22-BRG-CW-DW-34472	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	GENERAL LAYOUT 2/2	
RA140-22-BRG-CW-DW-34473	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	THICKNESS TABLE	
RA140-22-BRG-CW-DW-34481	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	DETAILS 1/12	
RA140-22-BRG-CW-DW-34482	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	DETAILS 2/12	
RA140-22-BRG-CW-DW-34483	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	DETAILS 3/12	
RA140-22-BRG-CW-DW-34484	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	DETAILS 4/12	
RA140-22-BRG-CW-DW-34485	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	DETAILS 5/12	
RA140-22-BRG-CW-DW-34486	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	DETAILS 6/12	
RA140-22-BRG-CW-DW-34487	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	DETAILS 7/12	
RA140-22-BRG-CW-DW-34488	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	DETAILS 8/12	
RA140-22-BRG-CW-DW-34489	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	DETAILS 9/12	
RA140-22-BRG-CW-DW-34490	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	DETAILS 10/12	
RA140-22-BRG-CW-DW-34491	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	DETAILS 11/12	
RA140-22-BRG-CW-DW-34492	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	DETAILS 12/12	
RA140-22-BRG-CW-BS-34496	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	STEEL LIST 1/3	
RA140-22-BRG-CW-BS-34497	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	STEEL LIST 2/3	
RA140-22-BRG-CW-BS-34498	B1	17/02/2016	MAIN BRIDGE	STEEL CROSS BEAM	STEEL LIST 3/3	



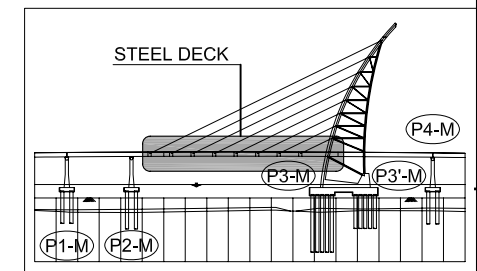
LEGEND:

 : WELDING SPLICE

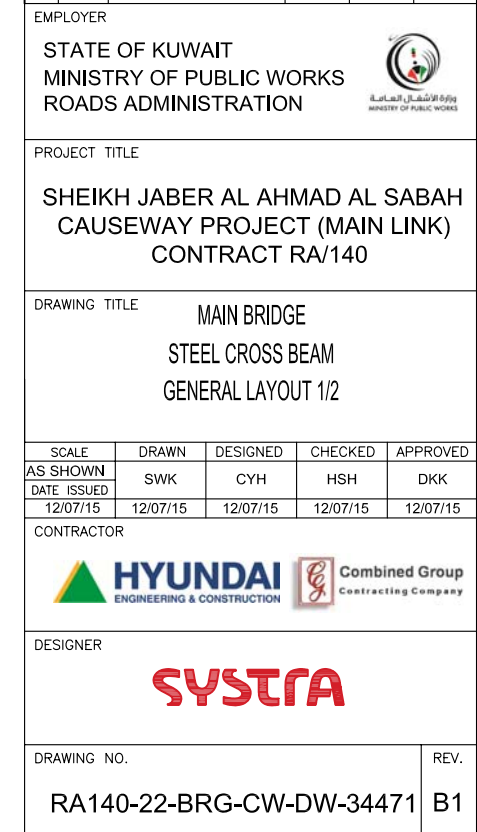
 : FIELD WELDING SPLICE

DWP-1 : DECK WORKING POINT-1
DWP-2 : DECK WORKING POINT-2
DWP-3 : DECK WORKING POINT-3

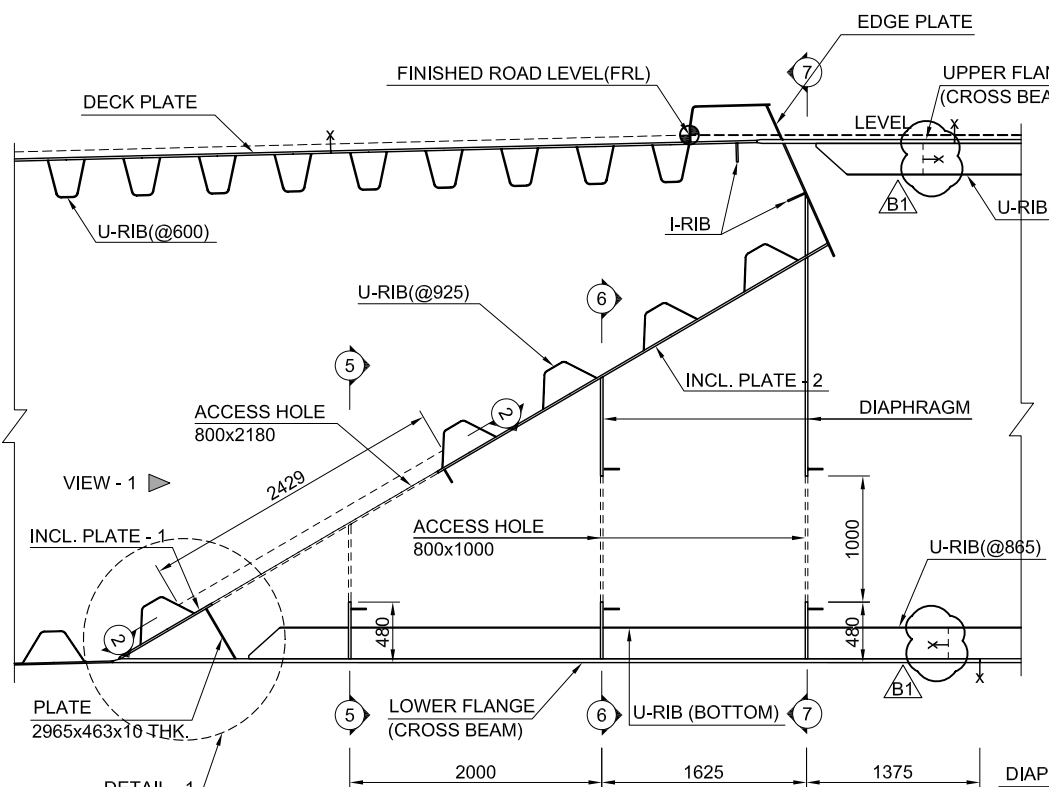
CCB : CONCRETE CROSS BEAM
SCB : STEEL CROSS BEAM
CW : WEST SIDE STAY CABLE
CE : EAST SIDE STAY CABLE



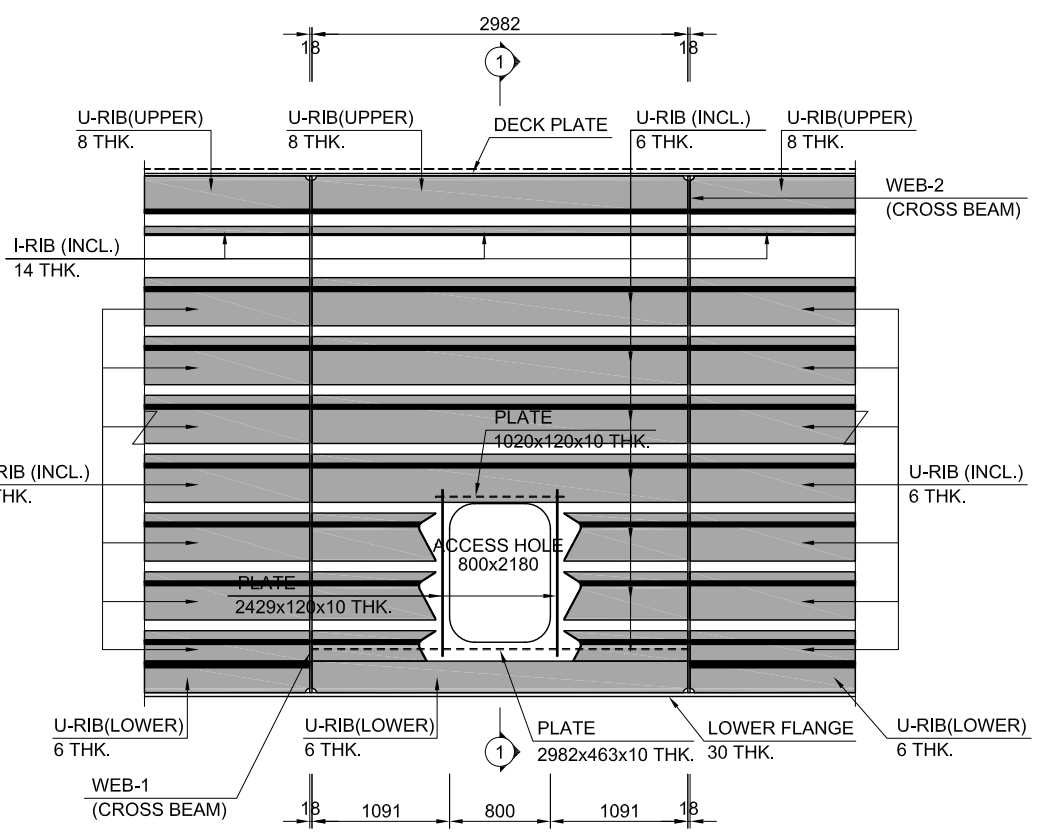
B1	17/02/16	Updated As Shown In Clouds	SWK	HSB	DKK
A4	12/11/15	Updated As Shown In Clouds	SWK	HSB	DKK
A3	14/10/15	Updated As Shown In Clouds	SWK	HSB	DKK
A1	12/07/15	First Issue	SWK	HSB	DKK
REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHEC.	APPRO.



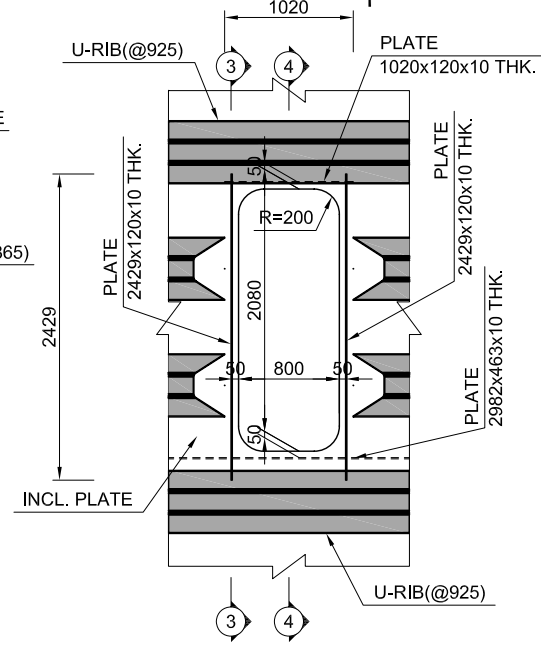
DRAWING NO.	REV.
RA140-22-BRG-CW-DW-34471	B1



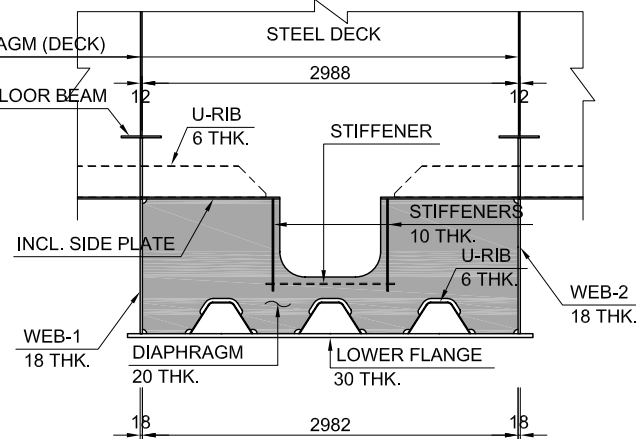
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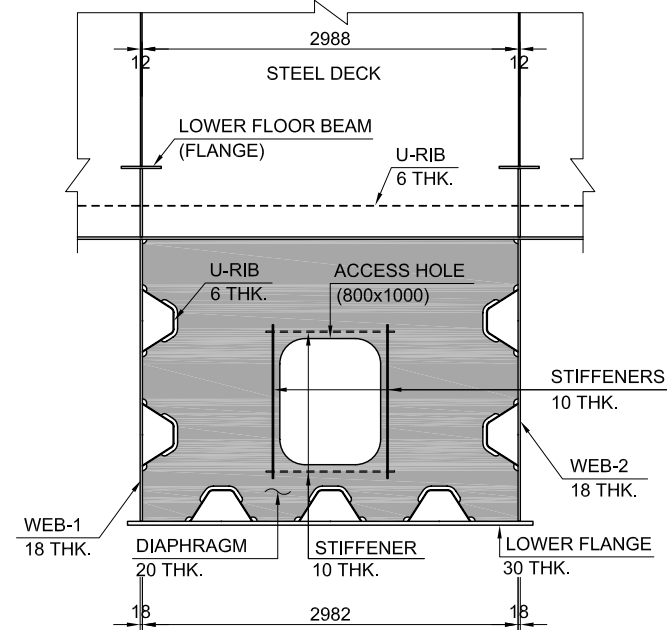
VIEW "1"
SCALE : 1/30



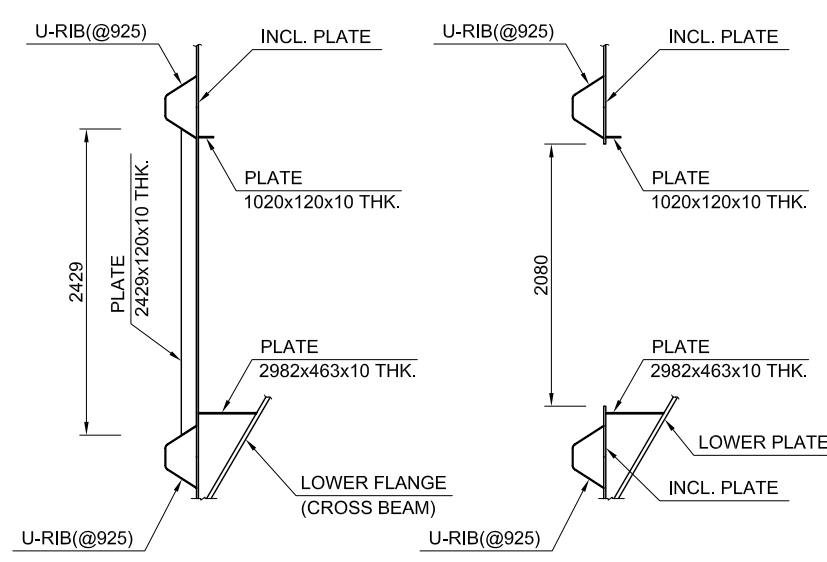
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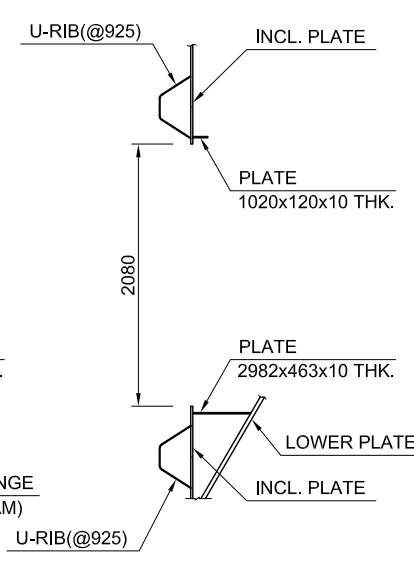
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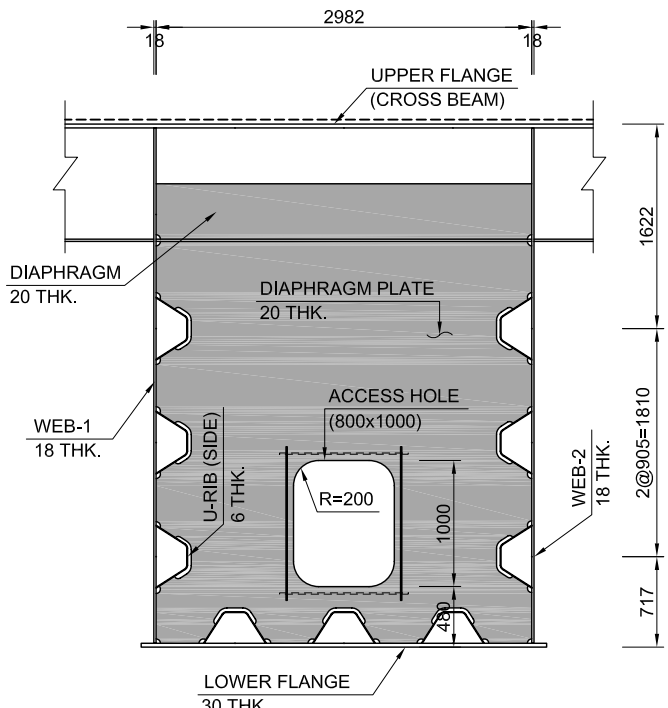
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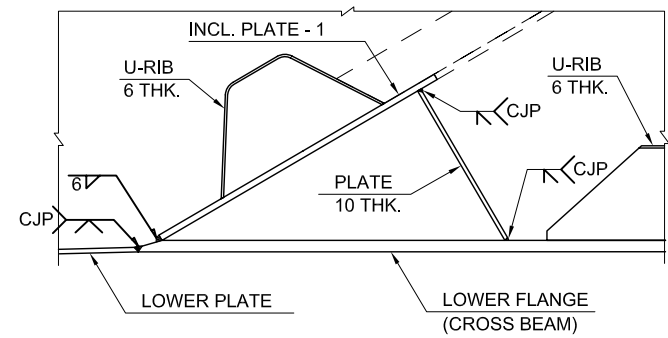
SECTION 3-3
SCALE : 1/30



SECTION 4-4
SCALE : 1/30



SECTION 7-7
SCALE : 1/30



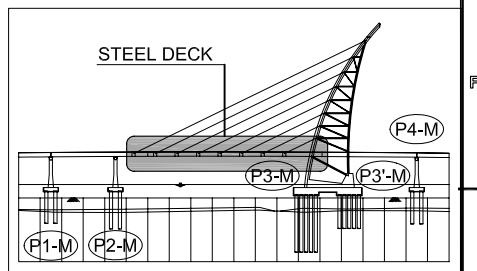
DETAIL - 1
SCALE : 1/10

NOTES:

- ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
- STEEL MATERIALS:
PLATE IS ASTM A709M (GRADE 50)

LEGEND:

✕ : WELDING SPLICE
⊗ : FIELD WELDING SPLICE



REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHEC.	APPRO.
B1	17/02/16	Updated As Shown In Clouds	SWK	HSK	DKK
A3	12/11/15	Updated As Shown In Clouds	SWK	HSK	DKK
A2	14/10/15	Updated As Shown In Clouds	SWK	HSK	DKK
A1	12/07/15	First Issue	SWK	HSK	DKK

EMPLOYER
STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION

PROJECT TITLE
SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

DRAWING TITLE
MAIN BRIDGE
STEEL CROSS BEAM
GENERAL LAYOUT 2/2

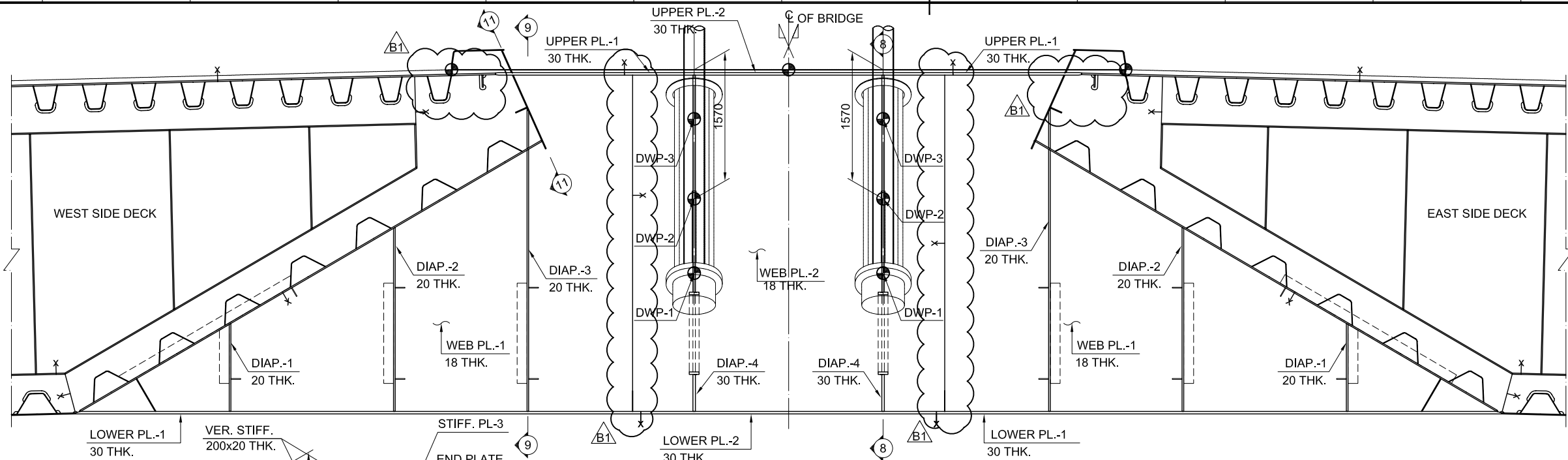
SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	HSK	DKK
DATE ISSUED	12/07/15	12/07/15	12/07/15	12/07/15

CONTRACTOR
HYUNDAI ENGINEERING & CONSTRUCTION
Combined Group Contracting Company

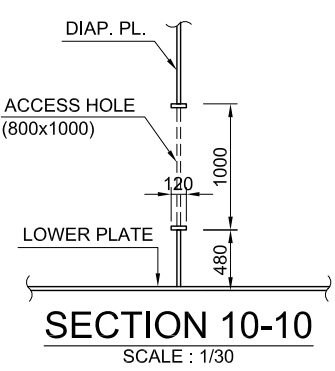
DESIGNER
SYSTRA

DRAWING NO.
RA140-22-BRG-CW-DW-34472

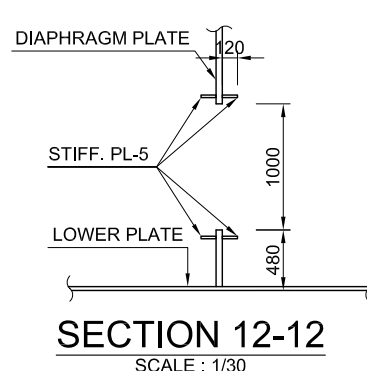
REV.
B1



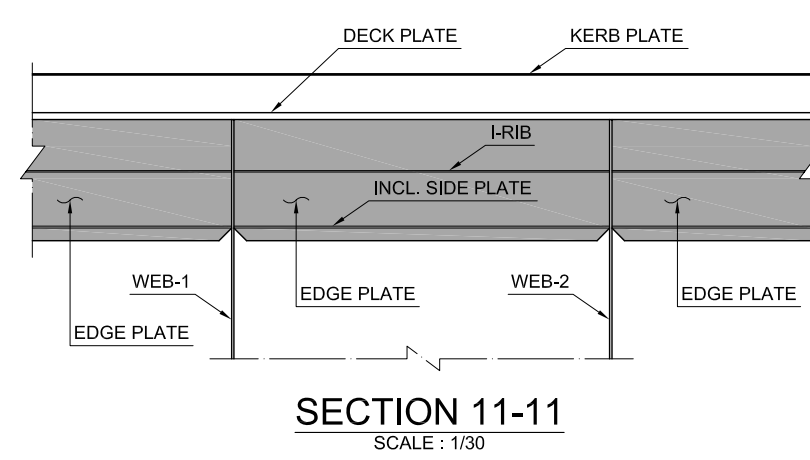
ELEVATION VIEW OF CROSS BEAM
SCALE : 1/30



SECTION 10-10
SCALE : 1/30



SECTION 12-12
SCALE : 1/30



SECTION 11-11
SCALE : 1/30

POSITION	ANCHORAGE TUBE			STIFFENERS				ACCESS HOLE STIFFENERS		
	BEARING PL.	END PLATE	STEEL TUBE	STIFF. PL-1 STIFF. PL-1a	STIFF. PL-2	STIFF. PL-3	STIFF. PL-4	DIAP.-1 TO DIAP.-3 STIFF. PL-5	DIAP.-4 STIFF. PL-6	DIAP.-5 STIFF. PL-7
SCB-1	Φ800, 130 THK.	Φ800, 20 THK.	Φ481, 50 THK.	50 THK.	50 THK.	30 THK.	30 THK.	10 THK.	10 THK.	30 THK.
SCB-2	Φ800, 130 THK.	Φ800, 20 THK.	Φ481, 50 THK.	50 THK.	50 THK.	30 THK.	30 THK.	10 THK.	10 THK.	30 THK.
SCB-3	Φ800, 130 THK.	Φ800, 20 THK.	Φ481, 50 THK.	50 THK.	50 THK.	30 THK.	30 THK.	10 THK.	10 THK.	30 THK.
SCB-4	Φ800, 130 THK.	Φ800, 20 THK.	Φ481, 50 THK.	50 THK.	50 THK.	30 THK.	30 THK.	10 THK.	10 THK.	30 THK.
SCB-5	Φ800, 120 THK.	Φ800, 20 THK.	Φ458, 45 THK.	45 THK.	45 THK.	30 THK.	30 THK.	10 THK.	10 THK.	30 THK.
SCB-6	Φ800, 120 THK.	Φ800, 20 THK.	Φ428, 45 THK.	45 THK.	45 THK.	30 THK.	30 THK.	10 THK.	10 THK.	30 THK.
SCB-7	Φ800, 120 THK.	Φ800, 20 THK.	Φ428, 45 THK.	45 THK.	45 THK.	30 THK.	30 THK.	10 THK.	10 THK.	30 THK.

THICKNESS OF CROSS BEAM PLATE (1)
SCALE : 1/30

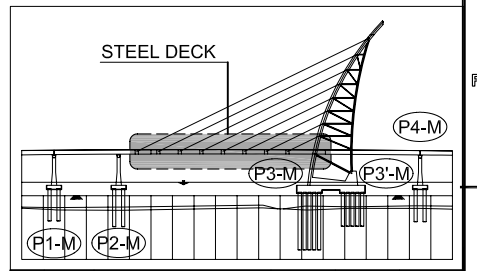
POSITION	UPPER PLATE		LOWER PLATE		WEB-1		WEB-2		DIAPHRAGM PLATE			
	PL.-1	PL.-2	PL.-1	PL.-2	WEB PL-1	WEB PL-2	WEB PL-1	WEB PL-2	DIAP.-1	DIAP.-2	DIAP.-3	DIAP.-4
SCB-1	30 THK.	30 THK.	30 THK.	30 THK.	18 THK.	18 THK.	18 THK.	18 THK.	20 THK.	20 THK.	20 THK.	30 THK.
SCB-2	30 THK.	30 THK.	30 THK.	30 THK.	18 THK.	18 THK.	18 THK.	18 THK.	20 THK.	20 THK.	20 THK.	30 THK.
SCB-3	30 THK.	30 THK.	30 THK.	30 THK.	18 THK.	18 THK.	18 THK.	18 THK.	20 THK.	20 THK.	20 THK.	30 THK.
SCB-4	30 THK.	30 THK.	30 THK.	30 THK.	18 THK.	18 THK.	18 THK.	18 THK.	20 THK.	20 THK.	20 THK.	30 THK.
SCB-5	30 THK.	30 THK.	30 THK.	30 THK.	18 THK.	18 THK.	18 THK.	18 THK.	20 THK.	20 THK.	20 THK.	30 THK.
SCB-6	30 THK.	30 THK.	30 THK.	30 THK.	18 THK.	18 THK.	18 THK.	18 THK.	20 THK.	20 THK.	20 THK.	30 THK.
SCB-7	30 THK.	30 THK.	30 THK.	30 THK.	18 THK.	18 THK.	18 THK.	18 THK.	20 THK.	20 THK.	20 THK.	30 THK.

(*) WEB PLATE (WEB-1: DWP-1 SIDE WEB, WEB-2: DWP-3 SIDE WEB)

THICKNESS OF CROSS BEAM PLATE (2)
SCALE : 1/30

- NOTES:**
- ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
 - STEEL MATERIALS:
PLATE IS ASTM A709M (GRADE 345)
 - FOR DWP-1, DWP-2, DWP-3 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34653.

- LEGEND:**
- ✕ : WELDING SPLICE
⊗ : FIELD WELDING SPLICE
- DWP-1 : DECK WORKING POINT-1
DWP-2 : DECK WORKING POINT-2
DWP-3 : DECK WORKING POINT-3
SCB : STEEL CROSS BEAM
HOR. : HORIZONTAL
VER. : VERTICAL
DIAP. : DIAPHRAGM
STIFF. : STIFFENERS
PL. : PLATE



B1	17/02/16	Updated As Shown In Clouds	SWK	HSK	DKK
A2	12/11/15	Updated As Shown In Clouds	SWK	HSK	DKK
A1	14/10/15	First Issue	SWK	HSK	DKK
REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHEC.	APPRO.

EMPLOYER
STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION

PROJECT TITLE
SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

DRAWING TITLE
MAIN BRIDGE
STEEL CROSS BEAM
THICKNESS TABLE

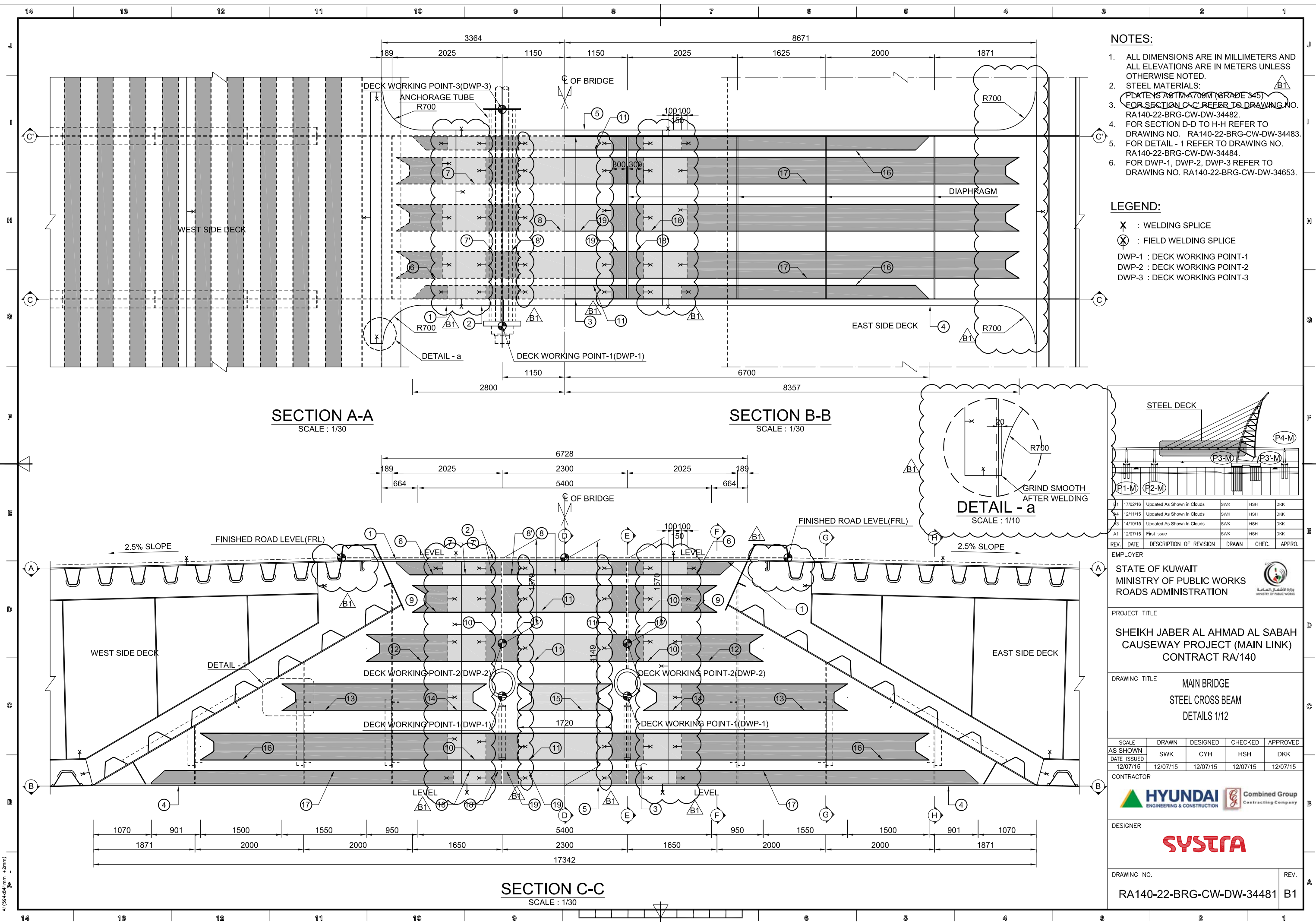
SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	HSK	DKK
DATE ISSUED	14/10/15	14/10/15	14/10/15	14/10/15

CONTRACTOR
HYUNDAI Engineering & Construction
Combined Group Contracting Company

DESIGNER
SYSTRA

DRAWING NO.
RA140-22-BRG-CW-DW-34473

REV.
B1

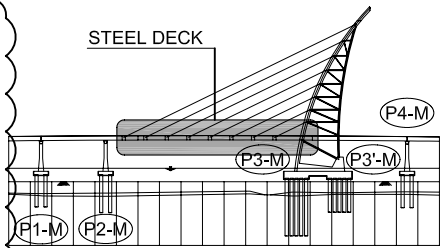


NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
2. STEEL MATERIALS: PLATE SASTM A700M (GRADE 345)
3. FOR SECTION C-C REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34482.
4. FOR SECTION D-D TO H-H REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34483.
5. FOR DETAIL - 1 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34484.
6. FOR DWP-1, DWP-2, DWP-3 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34653.

LEGEND:

- ✕ : WELDING SPLICE
⊗ : FIELD WELDING SPLICE
DWP-1 : DECK WORKING POINT-1
DWP-2 : DECK WORKING POINT-2
DWP-3 : DECK WORKING POINT-3



REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHEC.	APPRO.
B1	17/02/16	Updated As Shown In Clouds	SWK	HSB	DKK
A4	12/11/15	Updated As Shown In Clouds	SWK	HSB	DKK
A3	14/10/15	Updated As Shown In Clouds	SWK	HSB	DKK
A1	12/07/15	First Issue	SWK	HSB	DKK

EMPLOYER
STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION

PROJECT TITLE
SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

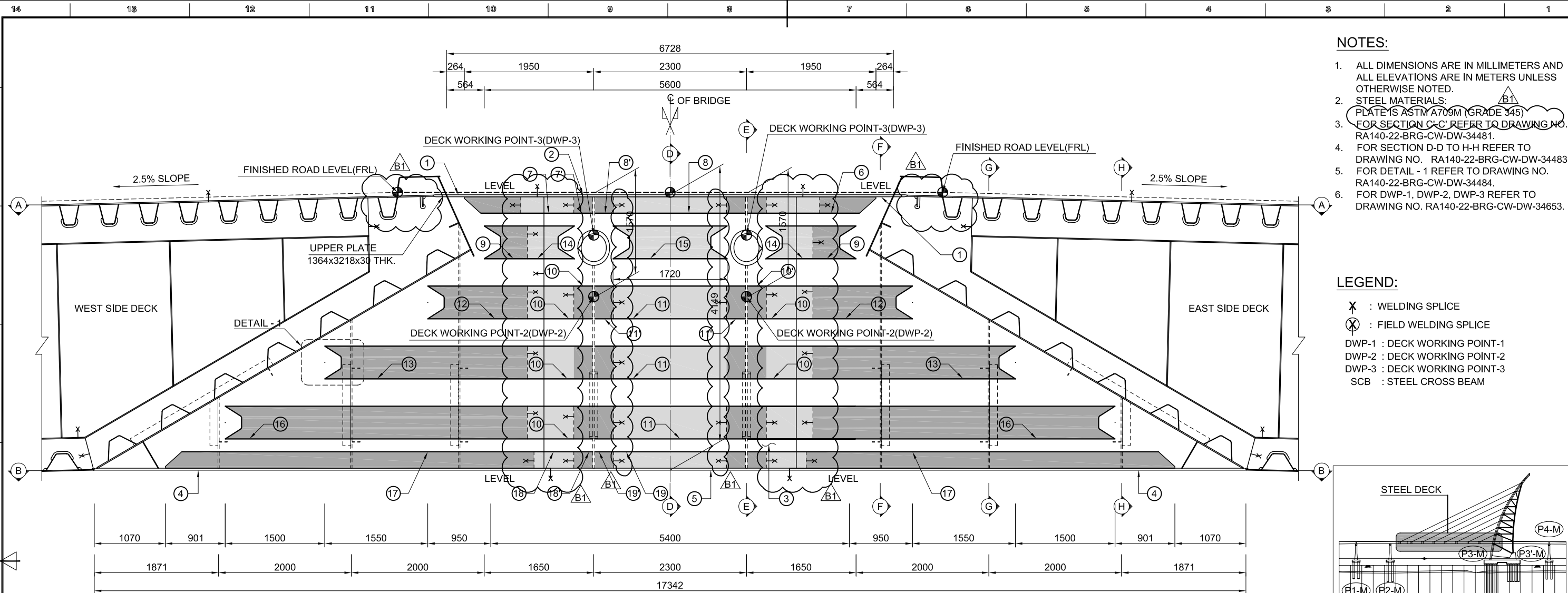
DRAWING TITLE
MAIN BRIDGE
STEEL CROSS BEAM
DETAILS 1/12

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	HSB	DKK
DATE ISSUED	12/07/15	12/07/15	12/07/15	12/07/15

CONTRACTOR
HYUNDAI ENGINEERING & CONSTRUCTION
Combined Group Contracting Company

DESIGNER
SYSTRA

DRAWING NO.
RA140-22-BRG-CW-DW-34481
REV.
B1



SECTION C'-C'
SCALE : 1/30

(UNIT : A CROSS BEAM)				
ID	MEMBER	COUNT	DIMENSION	REMARKS
①	UPPER PLATE	2 NOS.	1569x4620x30THK.	
②	UPPER PLATE	1 NOS.	4000x3220x30THK.	
③	WEB	2 NOS.	3800x4089x18THK.	
④	LOWER PLATE	2 NOS.	6883x4620x30THK.	
⑤	LOWER PLATE	1 NOS.	3600x3220x30THK.	
⑥	U-RIB (TOP)	6 NOS.	766x850x6 THK.	
⑦	U-RIB (TOP)	6 NOS.	766x800x6 THK.	
⑦	U-RIB (TOP)	6 NOS.	766x290x6 THK.	
⑧	U-RIB (TOP)	3 NOS.	766x1700x6 THK.	
⑧	U-RIB (TOP)	6 NOS.	766x290x6 THK.	
⑨	U-RIB (SIDE)	4 NOS.	766x650x6 THK.	
⑩	U-RIB (SIDE)	12 NOS.	766x700x6 THK.	
⑩	U-RIB (SIDE)	12 NOS.	766x290x6 THK.	

(UNIT : A CROSS BEAM)				
ID	MEMBER	COUNT	DIMENSION	REMARKS
⑪	U-RIB (SIDE)	6 NOS.	766x1700x6 THK.	
⑪	U-RIB (SIDE)	12 NOS.	766x290x6 THK.	
⑫	U-RIB (SIDE)	4 NOS.	766x1500x6 THK.	
⑬	U-RIB (SIDE)	4 NOS.	766x3050x6 THK.	
⑭	U-RIB (SIDE)	4 NOS.	766x710x6 THK.	
⑮	U-RIB (SIDE)	2 NOS.	766x1720x6 THK.	
⑯	U-RIB (SIDE)	4 NOS.	766x4550x6 THK.	
⑰	U-RIB (BOTTOM)	6 NOS.	766x5551x6 THK.	
⑱	U-RIB (BOTTOM)	6 NOS.	766x600x6 THK.	
⑱	U-RIB (BOTTOM)	6 NOS.	766x290x6 THK.	
⑱	U-RIB (BOTTOM)	3 NOS.	766x1700x6 THK.	
⑲	U-RIB (BOTTOM)	6 NOS.	766x290x6 THK.	

CROSS BEAM NO.			COUNT	REMARKS
CROSS BEAM	SCB-1 (S04 ~ S05)		1 NOS.	
	SCB-2 (S11 ~ S12)		1 NOS.	
	SCB-3 (S18 ~ S19)		1 NOS.	
	SCB-4 (S25 ~ S26)		1 NOS.	
	SCB-5 (S32 ~ S33)		1 NOS.	
	SCB-6 (S39 ~ S40)		1 NOS.	
	SCB-7 (S46 ~ S47)		1 NOS.	

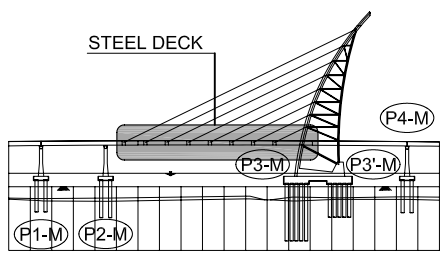
QUANTITY TABLE OF STEEL
SCALE : NONE

NOTES:

- ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
- STEEL MATERIALS:
PLATE IS ASTM A709M (GRADE 345)
- FOR SECTION C-C REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34481.
- FOR SECTION D-D TO H-H REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34483.
- FOR DETAIL - 1 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34484.
- FOR DWP-1, DWP-2, DWP-3 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34653.

LEGEND:

- ✕ : WELDING SPLICE
⊗ : FIELD WELDING SPLICE
DWP-1 : DECK WORKING POINT-1
DWP-2 : DECK WORKING POINT-2
DWP-3 : DECK WORKING POINT-3
SCB : STEEL CROSS BEAM



REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHEC.	APPRO.
B1	17/02/16	Updated As Shown In Clouds	SWK	HSK	DKK
A4	12/11/15	Updated As Shown In Clouds	SWK	HSK	DKK
A3	14/10/15	Updated As Shown In Clouds	SWK	HSK	DKK
A1	12/07/15	First Issue	SWK	HSK	DKK

EMPLOYER
STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION

PROJECT TITLE
SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

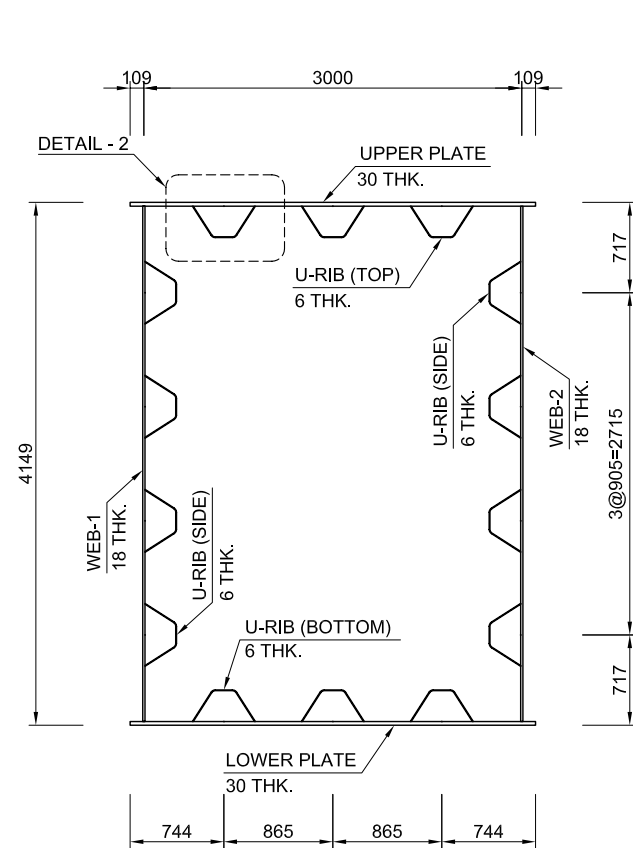
DRAWING TITLE
MAIN BRIDGE
STEEL CROSS BEAM
DETAILS 2/12

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	HSK	DKK
DATE ISSUED	12/07/15	12/07/15	12/07/15	12/07/15

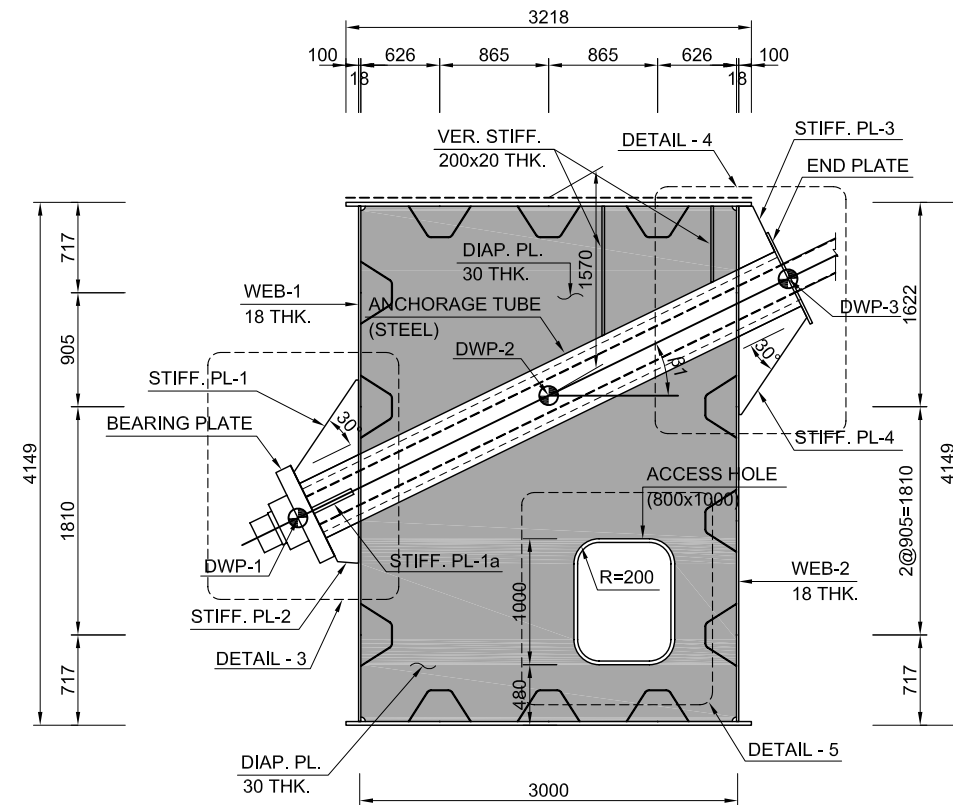
CONTRACTOR
HYUNDAI ENGINEERING & CONSTRUCTION
Combined Group Contracting Company

DESIGNER
SYSTRA

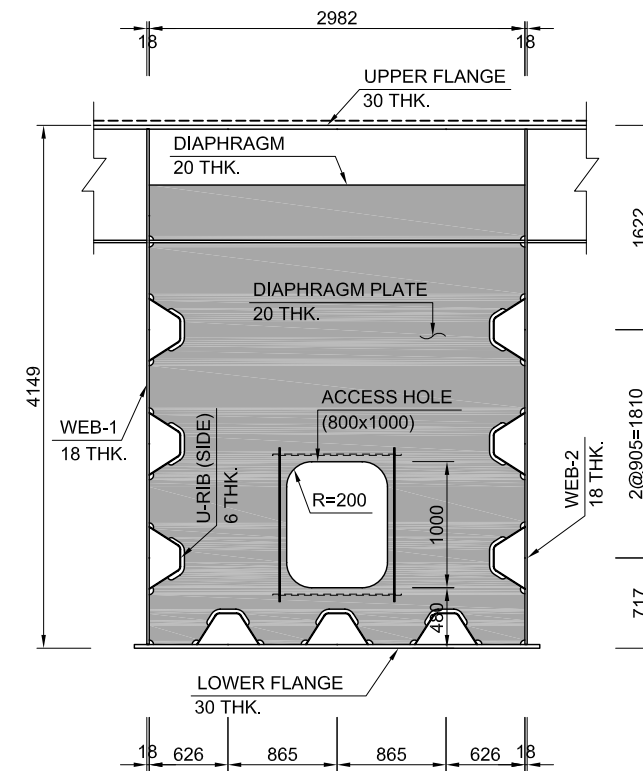
DRAWING NO.
RA140-22-BRG-CW-DW-34482
REV.
B1



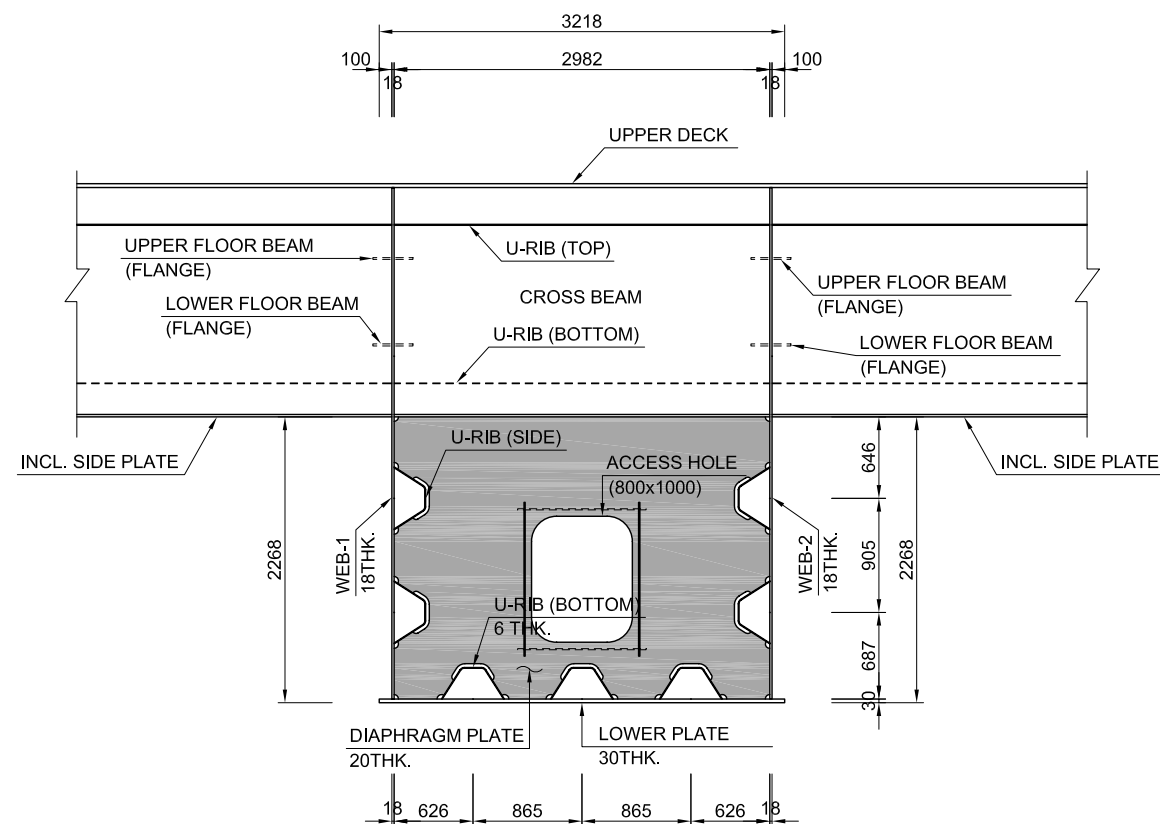
SECTION D-D
SCALE : 1/30



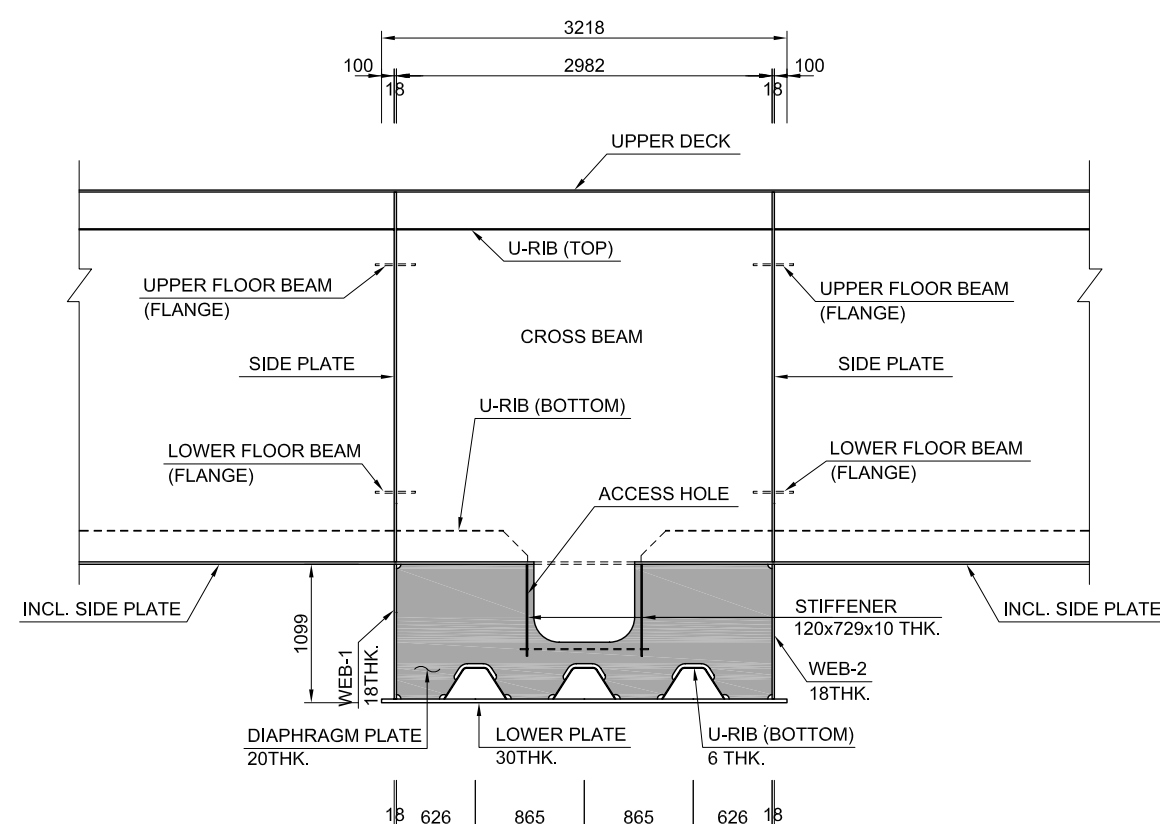
SECTION E-E
SCALE : 1/30



SECTION F-F
SCALE : 1/30



SECTION G-G
SCALE : 1/30



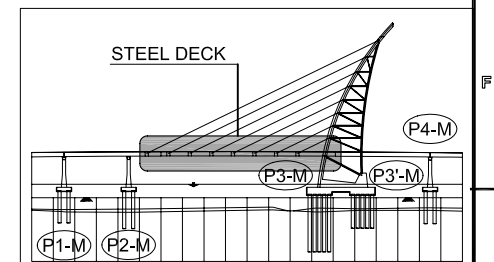
SECTION H-H
SCALE : 1/30

NOTES:

- ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
- STEEL MATERIALS:
PLATE IS ASTM A709M (GRADE 345)
- FOR SECTION D-D TO H-H REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34481 TO 34482.
- FOR DETAIL - 2 TO 5 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34484.
- FOR β1, DWP-1, DWP-2, DWP-3 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34653.

LEGEND:

- DWP-1 : DECK WORKING POINT-1
DWP-2 : DECK WORKING POINT-2
DWP-3 : DECK WORKING POINT-3



REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHEC.	APPRO.
B1	17/02/16	Updated As Shown In Clouds	SWK	HSK	DKK
A4	12/11/15	Updated As Shown In Clouds	SWK	HSK	DKK
A3	14/10/15	Updated As Shown In Clouds	SWK	HSK	DKK
A1	12/07/15	First Issue	SWK	HSK	DKK

EMPLOYER
STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION

PROJECT TITLE
SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

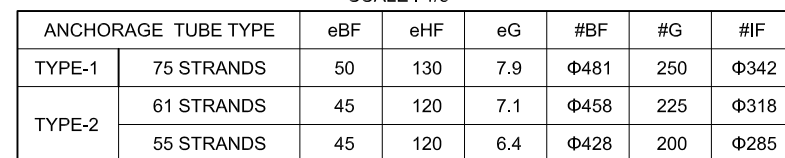
DRAWING TITLE
MAIN BRIDGE
STEEL CROSS BEAM
DETAILS 3/12

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	HSK	DKK
DATE ISSUED	12/07/15	12/07/15	12/07/15	12/07/15

CONTRACTOR
HYUNDAI ENGINEERING & CONSTRUCTION
Combined Group
Contracting Company

DESIGNER
SYSTRA

DRAWING NO.
RA140-22-BRG-CW-DW-34483
REV.
B1



DIMENSION TABLE
SCALE : NONE

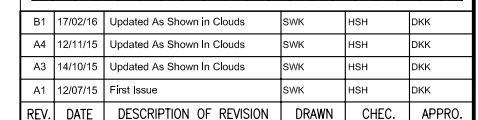


DETAIL - 3
SCALE : 1/10



1. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
2. STEEL MATERIALS:
PLATE IS ASTM A709M (GRADE 345)
3. FOR DETAIL-1 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34481 TO 34482.
4. FOR DETAIL - 2 TO 5 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34483.
5. DIMENSION TABLE REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34654.
6. FOR DWP-1, DWP-2, DWP-3 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34653.
7. FOR (*) THK. REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34473.

DWP-1 : DECK WORKING POINT-1
DWP-3 : DECK WORKING POINT-3
HOR : HORIZONTAL
VER : VERTICAL



NEW	DATE
EMPLOYER	

STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION

PROJECT TITLE

SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

DRAWING TITLE

MAIN BRIDGE
STEEL CROSS BEAM
DETAILS 4/12

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	HSH	DKK
DATE ISSUED				
12/07/15	12/07/15	12/07/15	12/07/15	12/07/15

12/07/19	
CONTRACTOR	



DESIGNER

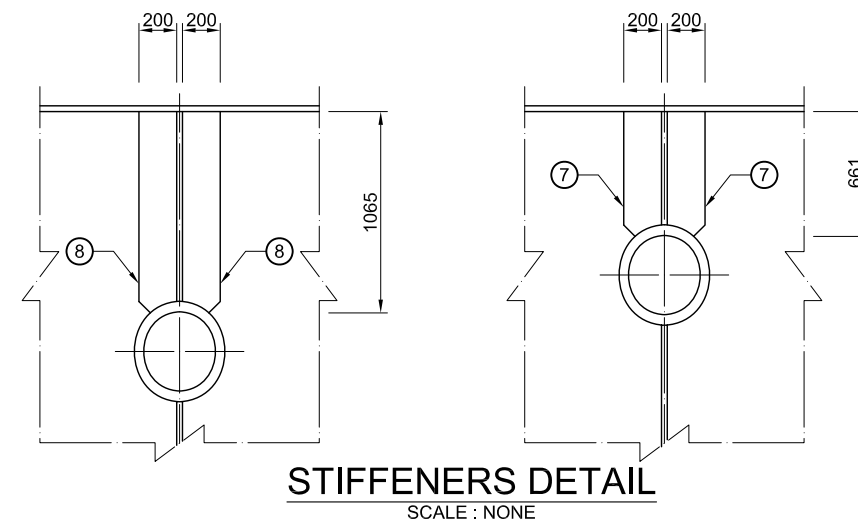
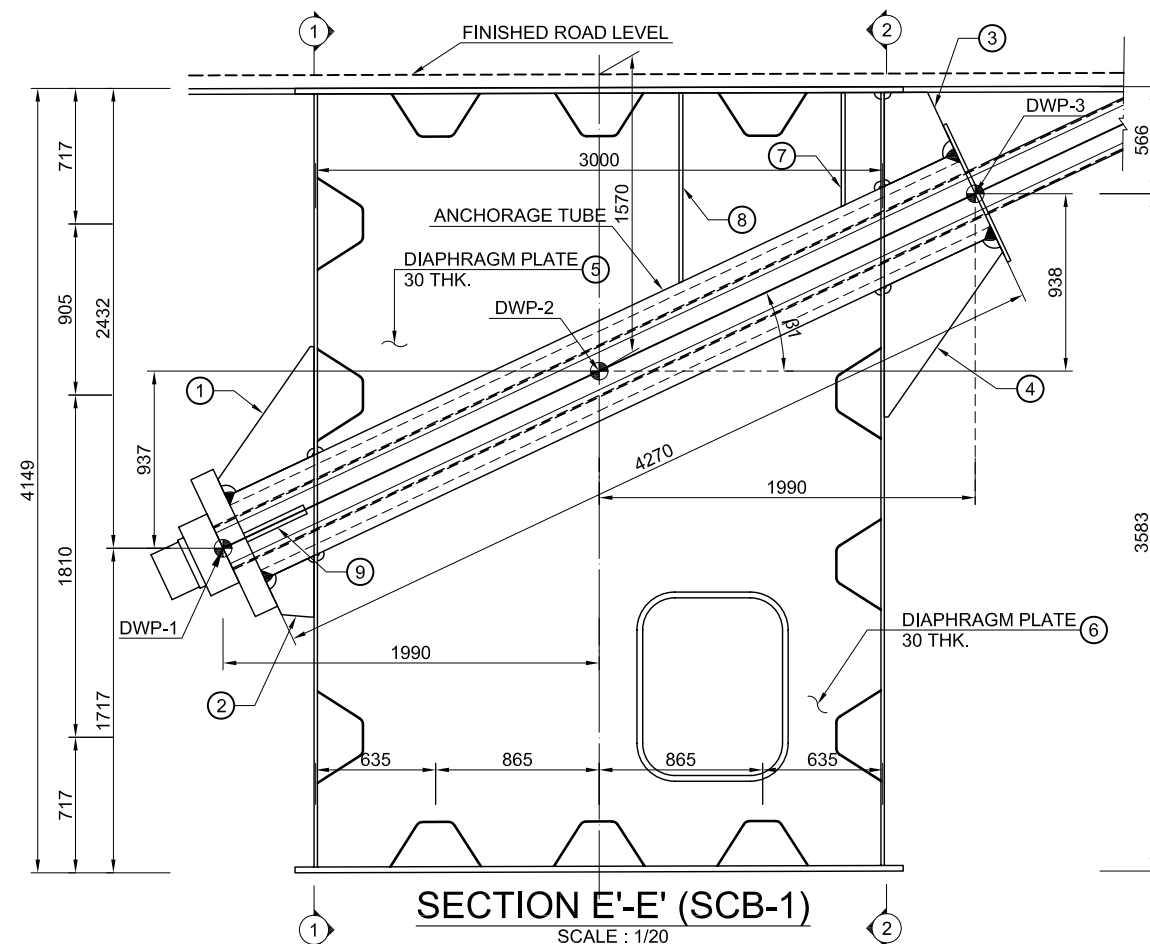


DRAWING NO.

RA140-22-BRG-CW-DW-34484 B1

(UNIT : A DIAPHRAGM)				
ID	MEMBER	COUNT	DIMENSION	REMARKS
①	STIFFENER	1 NOS.	3257x120x30THK.	ACCESS HOLE

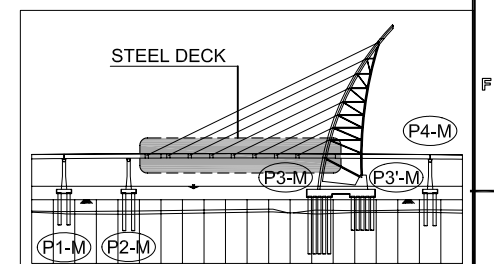
(UNIT : A DIAPHRAGM)



(SCB-1 / A CABLE)					
ID	MEMBER	B ₁	COUNT	DIMENSION	REMARKS
①	STIFFENER		1 NOS.	527x760x50 THK.	
②	STIFFENER		1 NOS.	325x261x50 THK.	
③	STIFFENER		1 NOS.	497x379x30 THK.	
④	STIFFENER		1 NOS.	963x626x30 THK.	
⑤	DIAPHRAGM		1 NOS.	1902x2982x30 THK.	
⑥	DIAPHRAGM		1 NOS.	3052x2982x30 THK.	
⑦	STIFFENER		2 NOS.	1065x200x20 THK.	
⑧	STIFFENER		2 NOS.	661x200x20 THK.	
⑨	STIFFENER		2 NOS.	350x100x50 THK.	

- NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
2. STEEL MATERIALS:
PLATE IS ASTM A709M (GRADE 345)
FOR SECTION E-E REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34481 TO 34482 SECTION E-E.
3. FOR β_1 , DWP-1, DWP-2, DWP-3 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34653.
4. COPE HOLES IN STIFF-1 TO STIFF-4 SHALL BE CLOSED AFTER WELDING.



B1	17/02/16	Updated As Shown in Clouds	SWK	HSB	DKK
A4	12/11/15	Updated As Shown In Clouds	SWK	HSB	DKK
A3	14/10/15	Updated As Shown In Clouds	SWK	HSB	DKK
A1	12/07/15	First Issue	SWK	HSB	DKK
REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHEC.	APPRO.

EMPLOYER	
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STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION

PROJECT TITLE

SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

DRAWING TITLE

MAIN BRIDGE
STEEL CROSS BEAM
DETAILS 5/12

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	HSH	DKK
DATE ISSUED				
12/07/15	12/07/15	12/07/15	12/07/15	12/07/15

12/07/19	
CONTRACTOR	

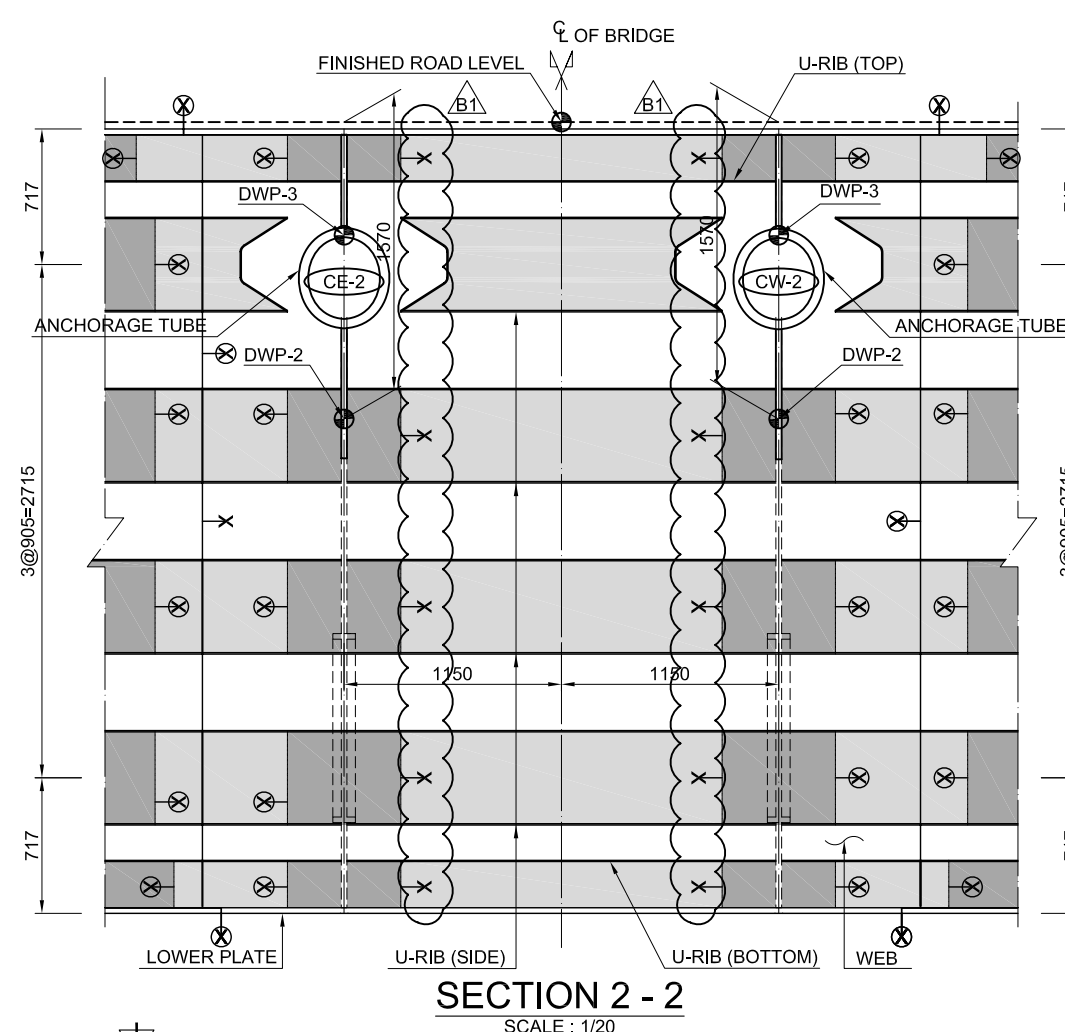
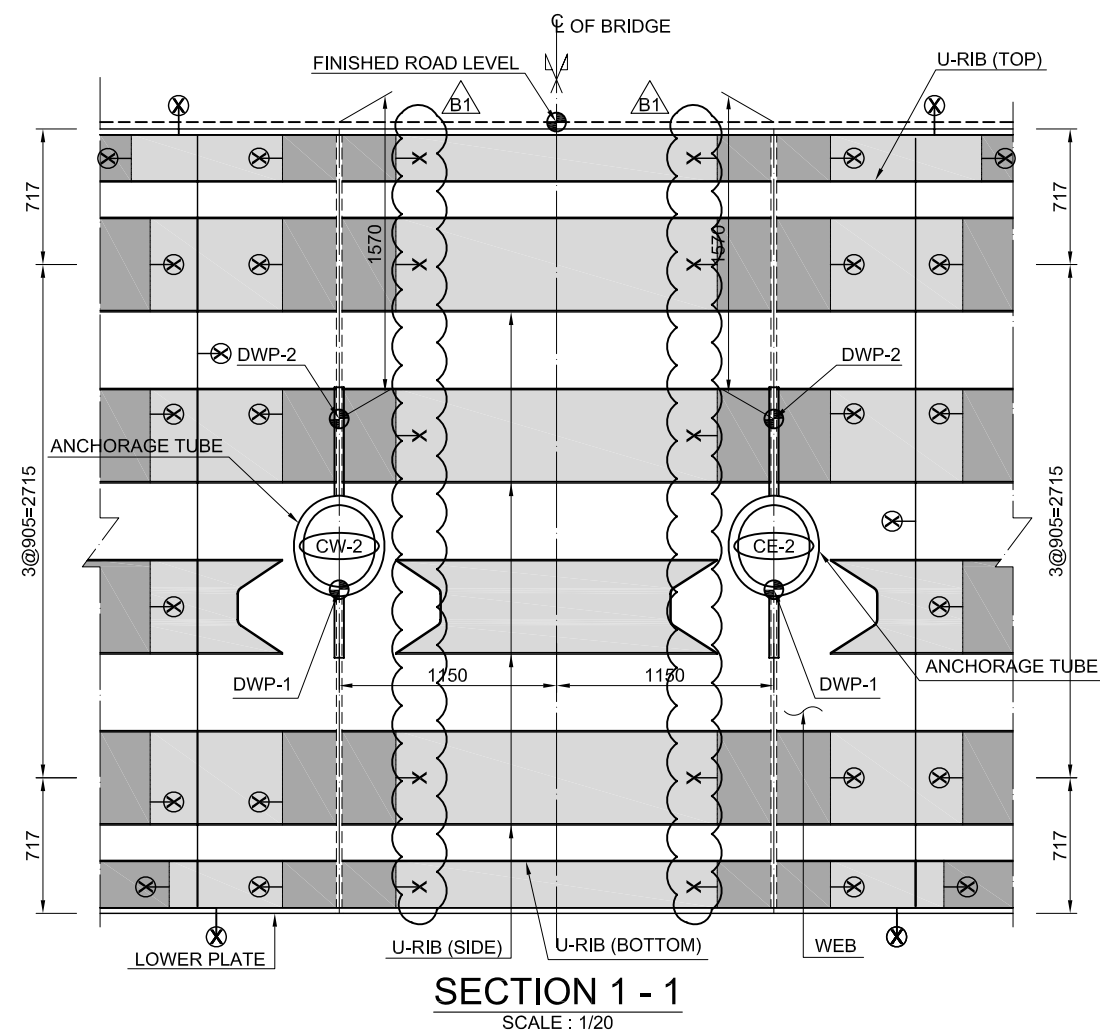


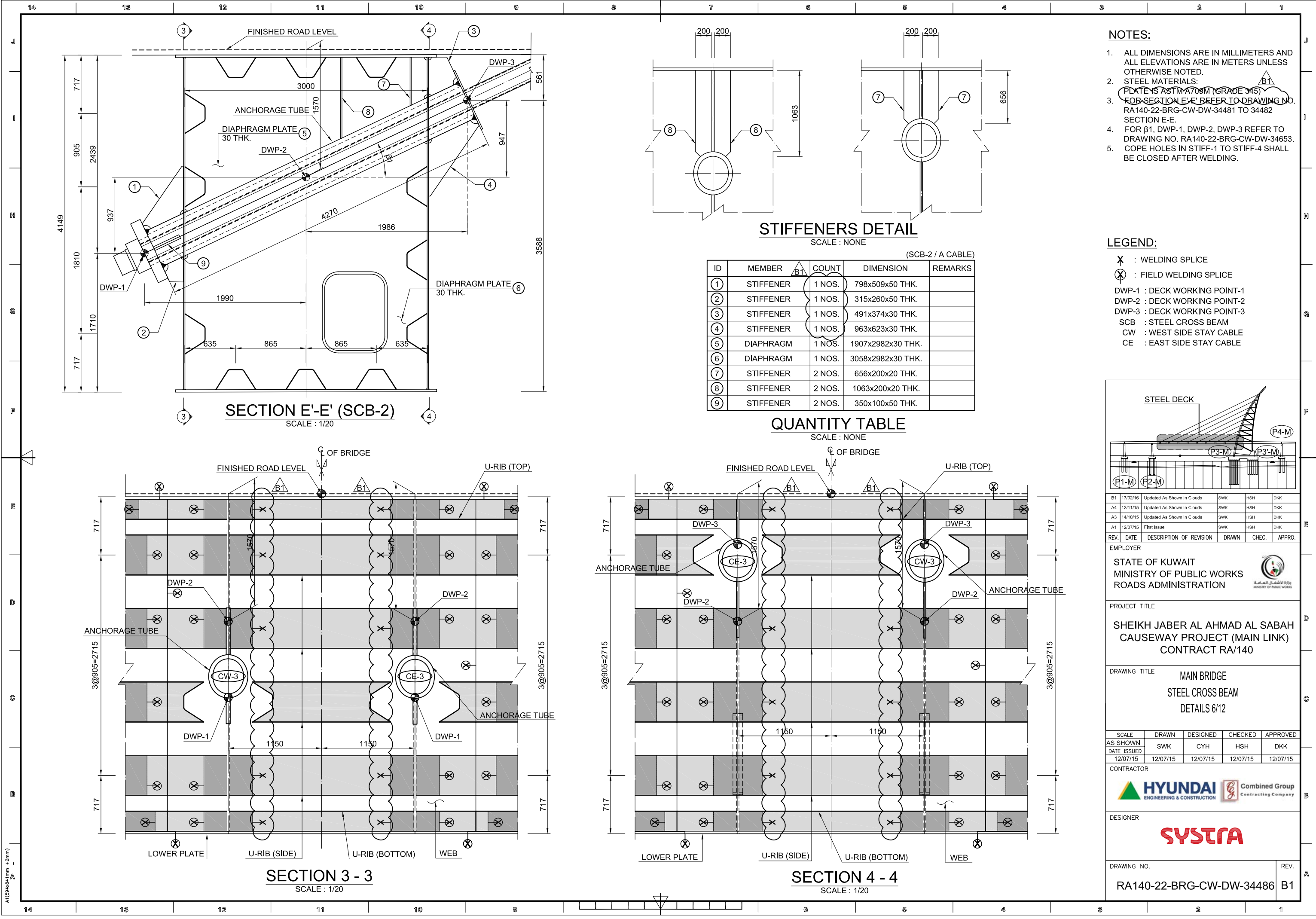

DESIGNER

SYSTRA

DRAWING NO.

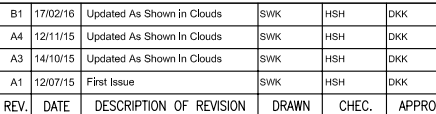
RA140-22-BRG-CW-DW-34485	B1
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1. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
2. STEEL MATERIALS:
 - PLATES ASTM A709M (GRADE 345)
3. FOR SECTION E-E' REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34481 TO 34482 SECTION E-E.
4. FOR B1, DWP-1, DWP-2, DWP-3 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34653.
5. COPE HOLES IN STIFF-1 TO STIFF-4 SHALL BE CLOSED AFTER WELDING.

 : WELDING SPLICE
 : FIELD WELDING SPLICE
 DWP-1 : DECK WORKING POINT-1
 DWP-2 : DECK WORKING POINT-2
 DWP-3 : DECK WORKING POINT-3
 SCB : STEEL CROSS BEAM
 CW : WEST SIDE STAY CABLE
 CE : EAST SIDE STAY CABLE



STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION

SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

DRAWING TITLE

MAIN BRIDGE
STEEL CROSS BEAM
DETAILS 6/12

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	HSH	DKK
DATE ISSUED				
12/07/15	12/07/15	12/07/15	12/07/15	12/07/15



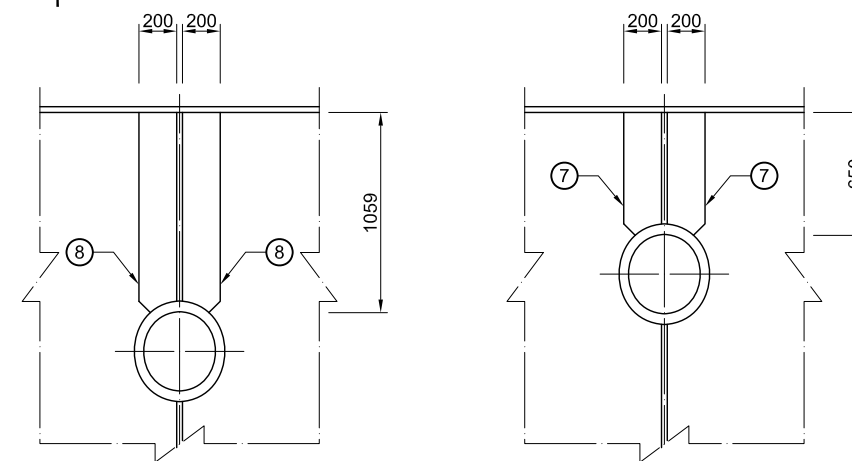
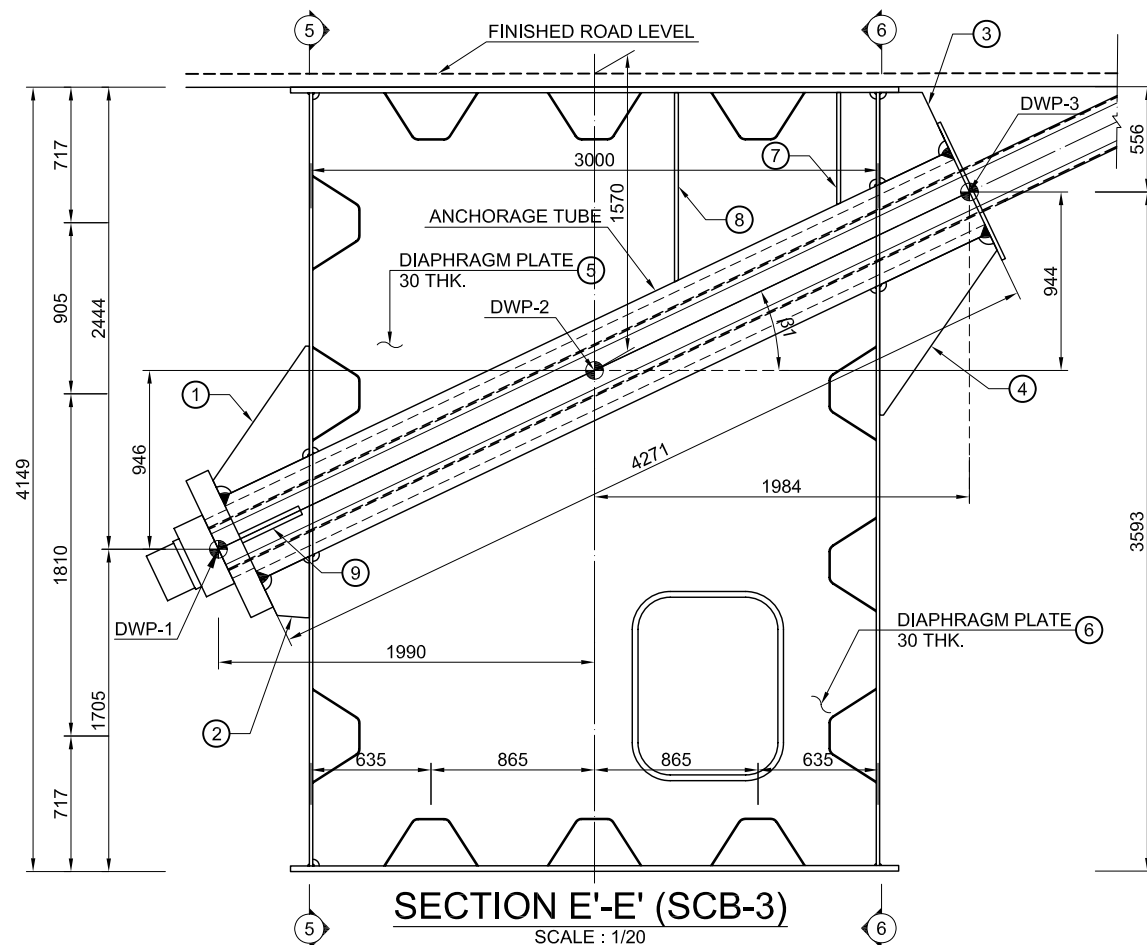
HYUNDAI
ENGINEERING & CONSTRUCTION



Combined Group
Contracting Company

SYSTRA

RA140-22-BRG-CW-DW-34486| B1



(SCB-3 / A CABLE)					
ID	MEMBER	B ₁	COUNT	DIMENSION	REMARKS
①	STIFFENER		1 NOS.	801x510x50 THK.	
②	STIFFENER		1 NOS.	325x260x50 THK.	
③	STIFFENER		1 NOS.	486x372x30 THK.	
④	STIFFENER		1 NOS.	963x621x30 THK.	
⑤	DIAPHRAGM		1 NOS.	1910x2982x30 THK.	
⑥	DIAPHRAGM		1 NOS.	3062x2982x30 THK.	
⑦	STIFFENER		2 NOS.	650x200x20 THK.	
⑧	STIFFENER		2 NOS.	1059x200x20 THK.	
⑨	STIFFENER		2 NOS.	350x100x50 THK.	

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
2. STEEL MATERIALS:
 - PLATE IS ASTM A709M (GRADE 345).
 - FOR SECTION E-E REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34481 TO 34482 SECTION E-E.
4. FOR $\beta 1$, DWP-1, DWP-2, DWP-3 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34653.
5. COPE HOLES IN STIFF-1 TO STIFF-4 SHALL BE CLOSED AFTER WELDING.

LEGEND:

X : WELDING SPLICE

(X) : FIELD WELDING SPLICE

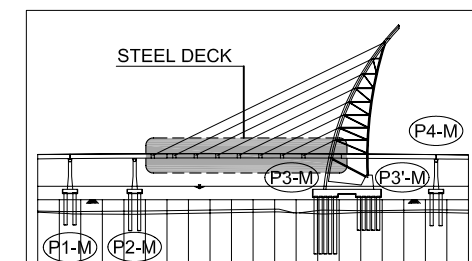
DWP-1 : DECK WORKING POINT-1

DWP-2 : DECK WORKING POINT-2

DWP-3 : DECK WORKING POINT-3
SCB : STEEL CROSS BEAM

CW : WEST SIDE STAY CABLE

CE : EAST SIDE STAY CABLE



B1	17/02/16	Updated As Shown in Clouds	SWK	HSB	DKK
A4	12/11/15	Updated As Shown In Clouds	SWK	HSB	DKK
A3	14/10/15	Updated As Shown In Clouds	SWK	HSB	DKK
A1	12/07/15	First Issue	SWK	HSB	DKK
REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHEC.	APPRO.

EMPLOYER	
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STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION

PROJECT TITLE

SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

DRAWING TITLE

MAIN BRIDGE
STEEL CROSS BEAM
DETAILS 7/12

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	SWK	DKK
DATE ISSUED				
12/07/15	12/07/15	12/07/15	12/07/15	12/07/15

12/07/19	
CONTRACTOR	




DESIGNER

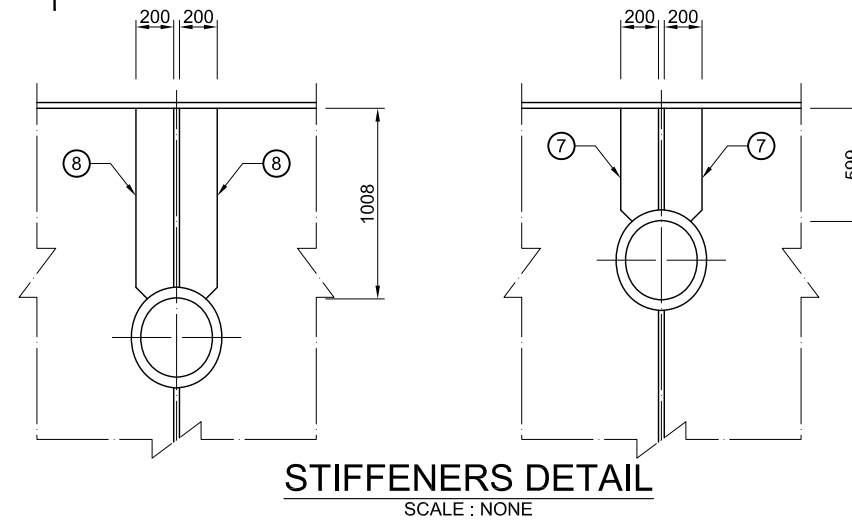
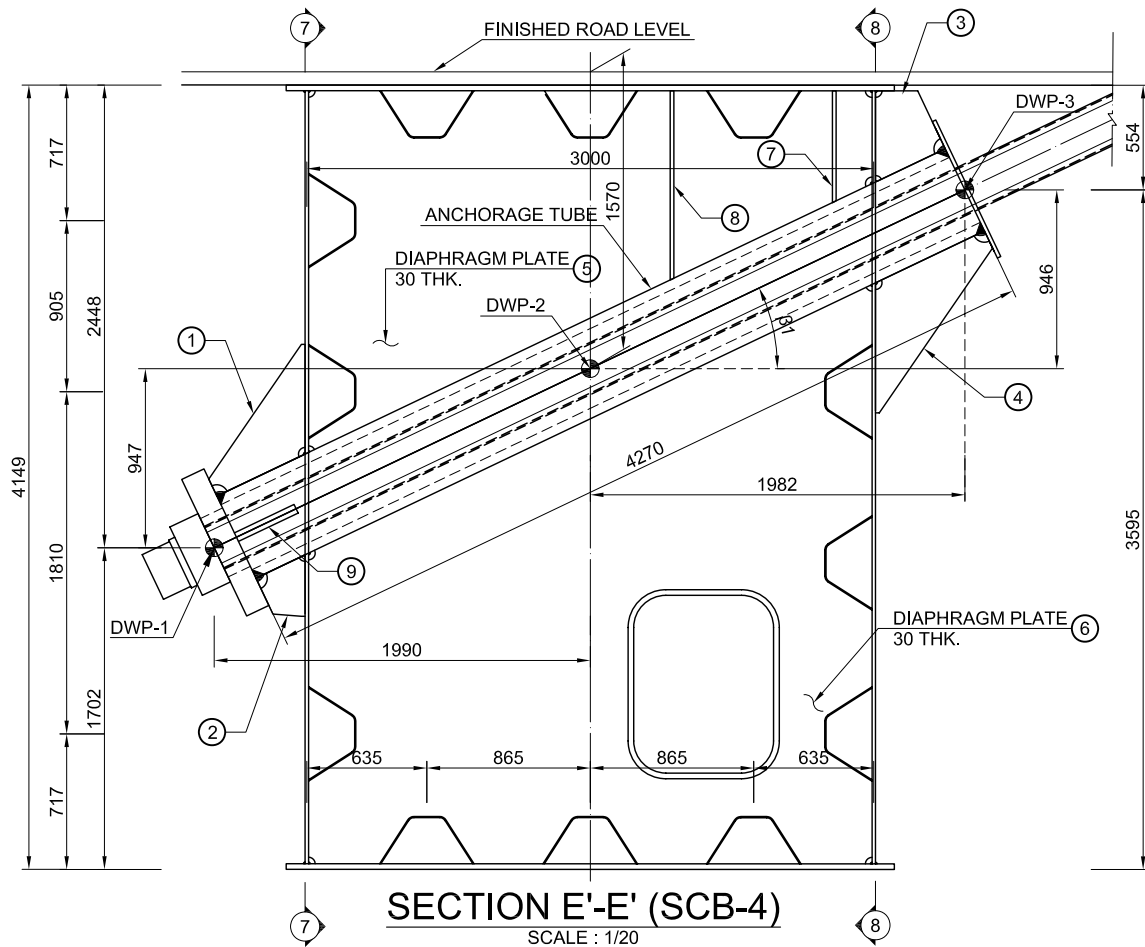
SYSTRA

DRAWING NO.

RA140-22-BRG-CW-DW-34487 B1

REV.

7	B1
---	----



(SCB-4 / A CABLE)				
ID	MEMBER	COUNT	DIMENSION	REMARKS
①	STIFFENER	1 NOS.	803x510x50 THK.	
②	STIFFENER	1 NOS.	325x260x50 THK.	
③	STIFFENER	1 NOS.	483x370x30 THK.	
④	STIFFENER	1 NOS.	962x620x30 THK.	
⑤	DIAPHRAGM	1 NOS.	1913x2982x30 THK.	
⑥	DIAPHRAGM	1 NOS.	3065x2982x30 THK.	
⑦	STIFFENER	2 NOS.	599x200x20 THK.	
⑧	STIFFENER	2 NOS.	1008x200x20 THK.	
⑨	STIFFENER	2 NOS.	350x100x50 THK.	

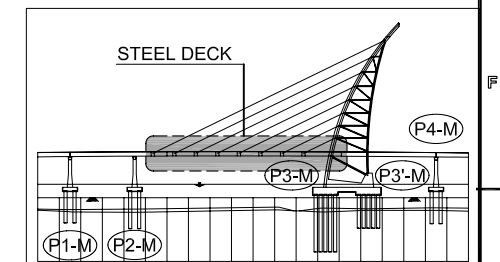
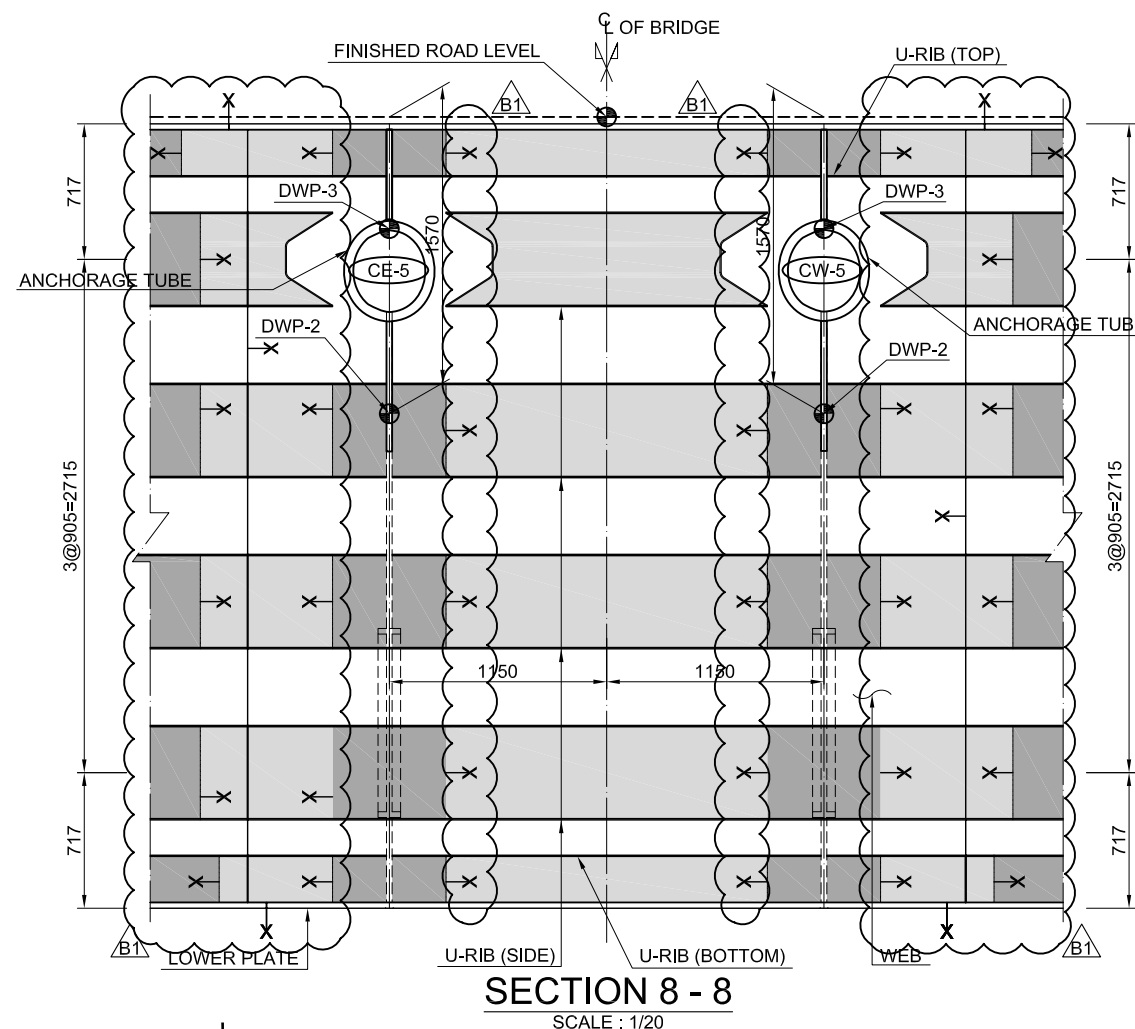
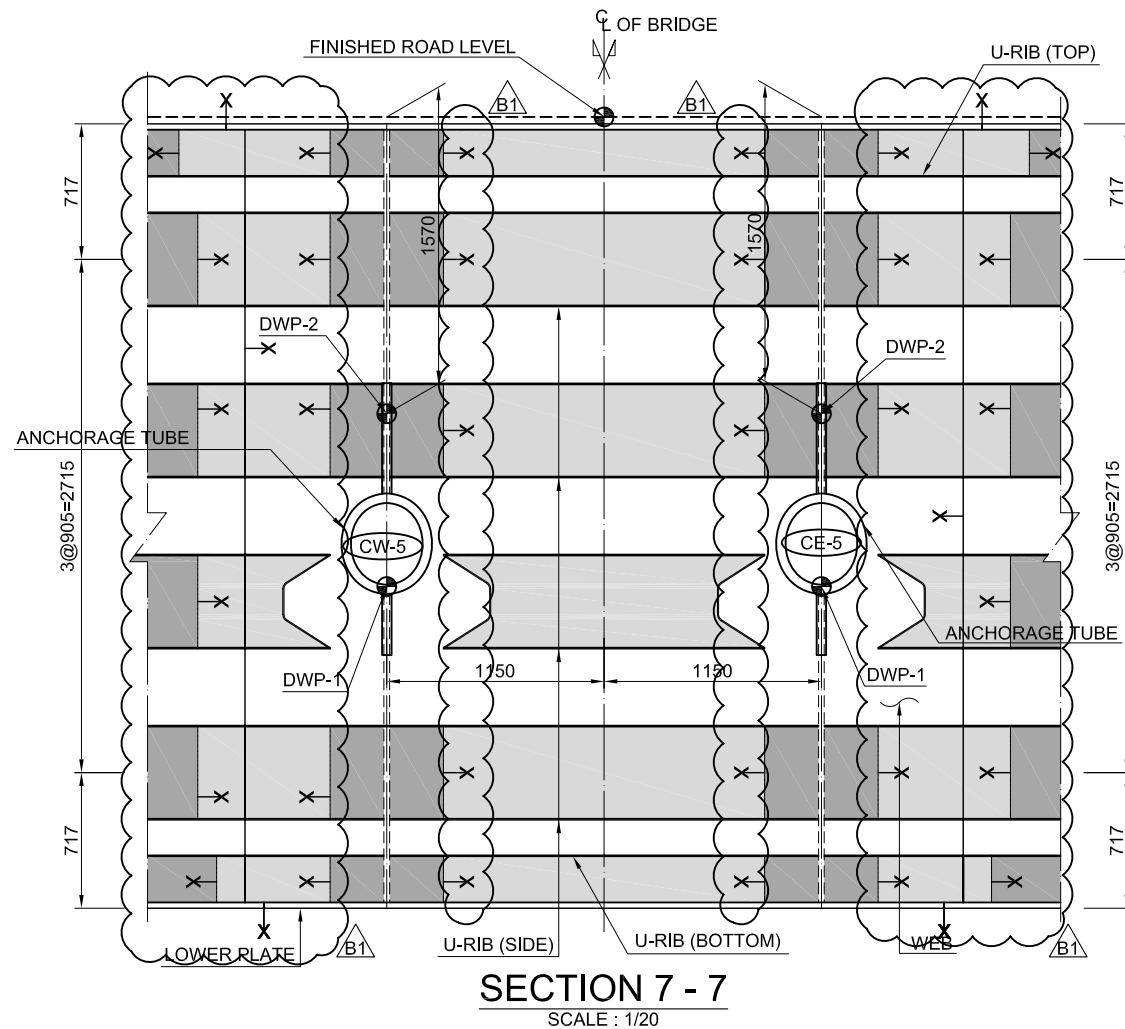
QUANTITY TABLE
SCALE : NONE

NOTES:

- ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
- STEEL MATERIALS:
PLATES ASTM A709M (GRADE 345)
- FOR SECTION E'-E' REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34481 TO 34482 SECTION E-E.
- FOR β1, DWP-1, DWP-2, DWP-3 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34653.
- COPE HOLES IN STIFF-1 TO STIFF-4 SHALL BE CLOSED AFTER WELDING.

LEGEND:

- ✕ : WELDING SPLICE
⊗ : FIELD WELDING SPLICE
- DWP-1 : DECK WORKING POINT-1
DWP-2 : DECK WORKING POINT-2
DWP-3 : DECK WORKING POINT-3
SCB : STEEL CROSS BEAM
CW : WEST SIDE STAY CABLE
CE : EAST SIDE STAY CABLE



REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHEC.	APPRO.
B1	17/02/16	Updated As Shown In Clouds	SWK	HSB	DKK
A4	12/11/15	Updated As Shown In Clouds	SWK	HSB	DKK
A3	14/10/15	Updated As Shown In Clouds	SWK	HSB	DKK
A1	12/07/15	First Issue	SWK	HSB	DKK

EMPLOYER
STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION

PROJECT TITLE
SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

DRAWING TITLE
MAIN BRIDGE
STEEL CROSS BEAM
DETAILS 8/12

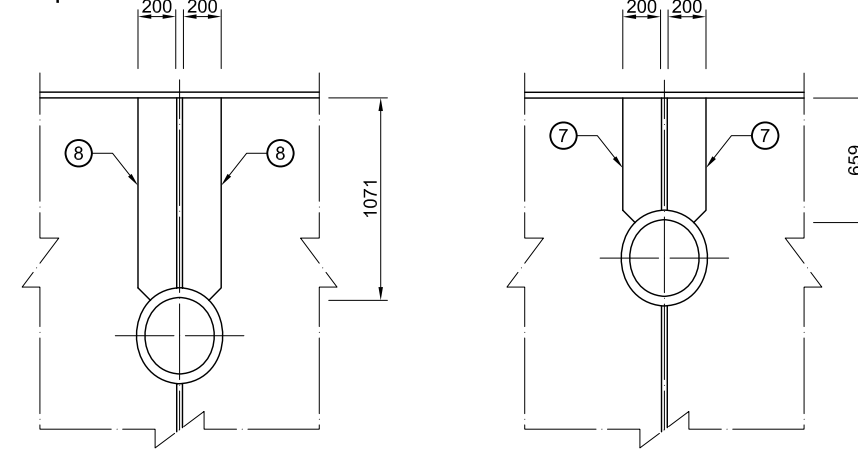
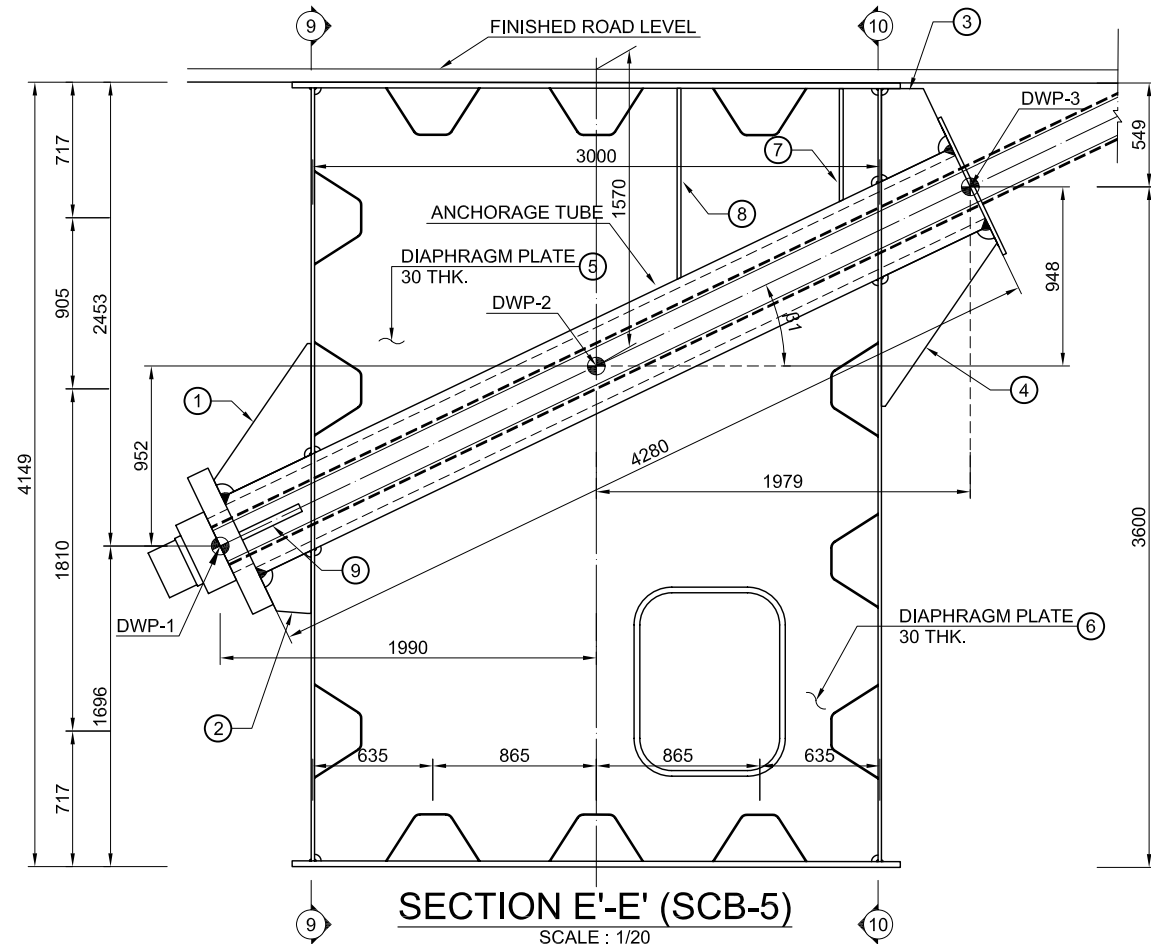
SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	HSB	DKK
DATE ISSUED	12/07/15	12/07/15	12/07/15	12/07/15

CONTRACTOR
HYUNDAI Engineering & Construction
Combined Group Contracting Company

DESIGNER
SYSTRA

DRAWING NO.
RA140-22-BRG-CW-DW-34488

REV.
B1

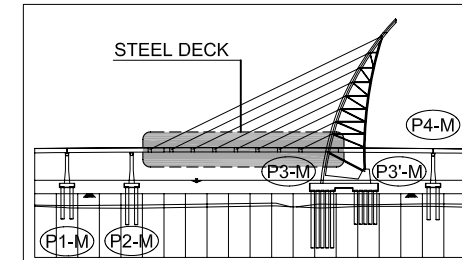


(SCB-5 / A CABLE)				
ID	MEMBER	COUNT	DIMENSION	REMARKS
①	STIFFENER	1 NOS.	812x515x45 THK.	
②	STIFFENER	1 NOS.	331x274x45 THK.	
③	STIFFENER	1 NOS.	488x371x30 THK.	
④	STIFFENER	1 NOS.	954x612x30 THK.	
⑤	DIAPHRAGM	1 NOS.	1931x2982x30 THK.	
⑥	DIAPHRAGM	1 NOS.	3082x2982x30 THK.	
⑦	STIFFENER	2 NOS.	659x200x20 THK.	
⑧	STIFFENER	2 NOS.	1071x200x20 THK.	
⑨	STIFFENER	2 NOS.	350x100x45 THK.	

QUANTITY TABLE
SCALE : NONE

- NOTES:**
- ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
 - STEEL MATERIALS: PLATE S ASTM A709M (GRADE 345)
 - FOR SECTION E'-E' REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34481 TO 34482 SECTION E-E.
 - FOR B1, DWP-1, DWP-2, DWP-3 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34653.
 - COPE HOLES IN STIFF-1 TO STIFF-4 SHALL BE CLOSED AFTER WELDING.

- LEGEND:**
- ✕ : WELDING SPLICE
⊗ : FIELD WELDING SPLICE
- DWP-1 : DECK WORKING POINT-1
DWP-2 : DECK WORKING POINT-2
DWP-3 : DECK WORKING POINT-3
SCB : STEEL CROSS BEAM
CW : WEST SIDE STAY CABLE
CE : EAST SIDE STAY CABLE



REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHEC.	APPRO.
B1	17/02/16	Updated As Shown In Clouds	SWK	HSK	DKK
A4	12/11/15	Updated As Shown In Clouds	SWK	HSK	DKK
A3	14/10/15	Updated As Shown In Clouds	SWK	HSK	DKK
A1	12/07/15	First Issue	SWK	HSK	DKK

EMPLOYER
STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION

PROJECT TITLE
SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

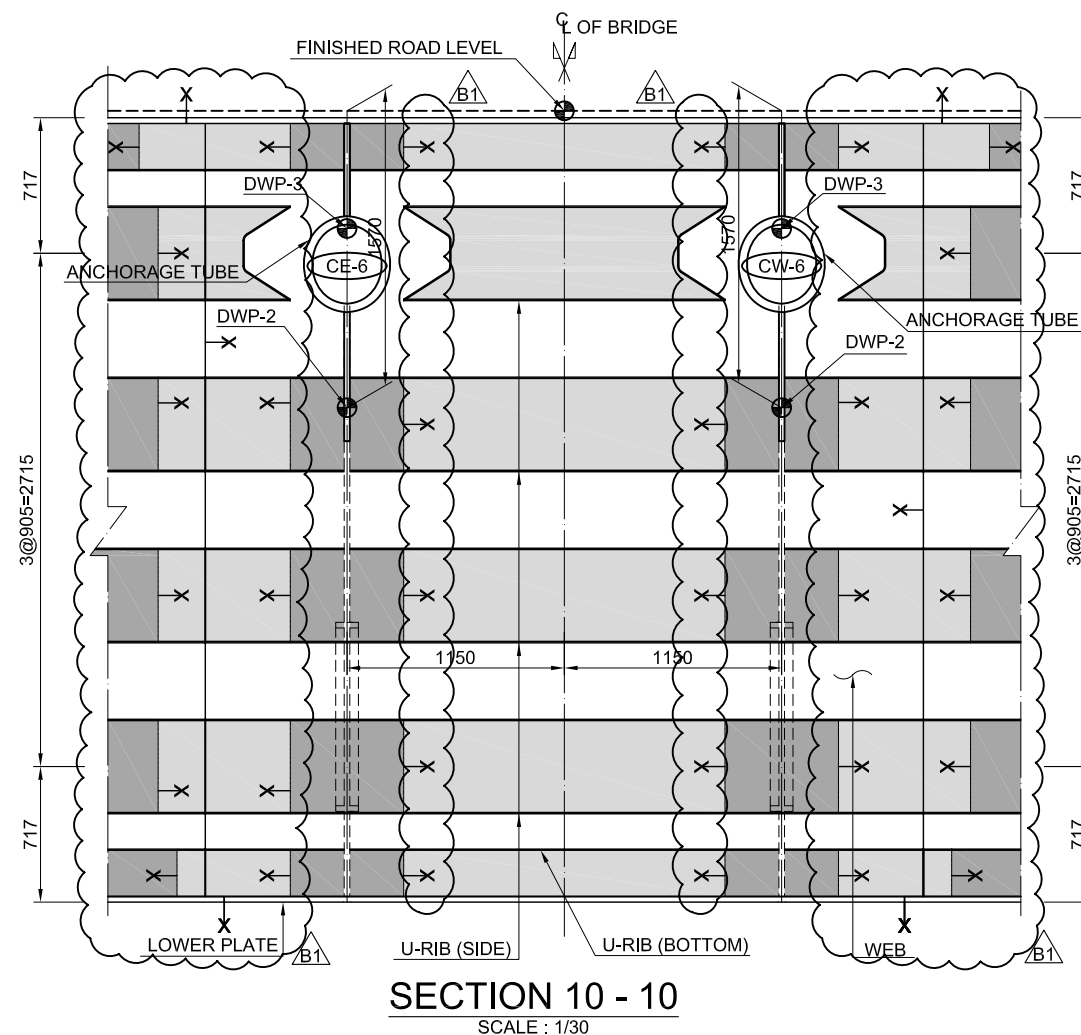
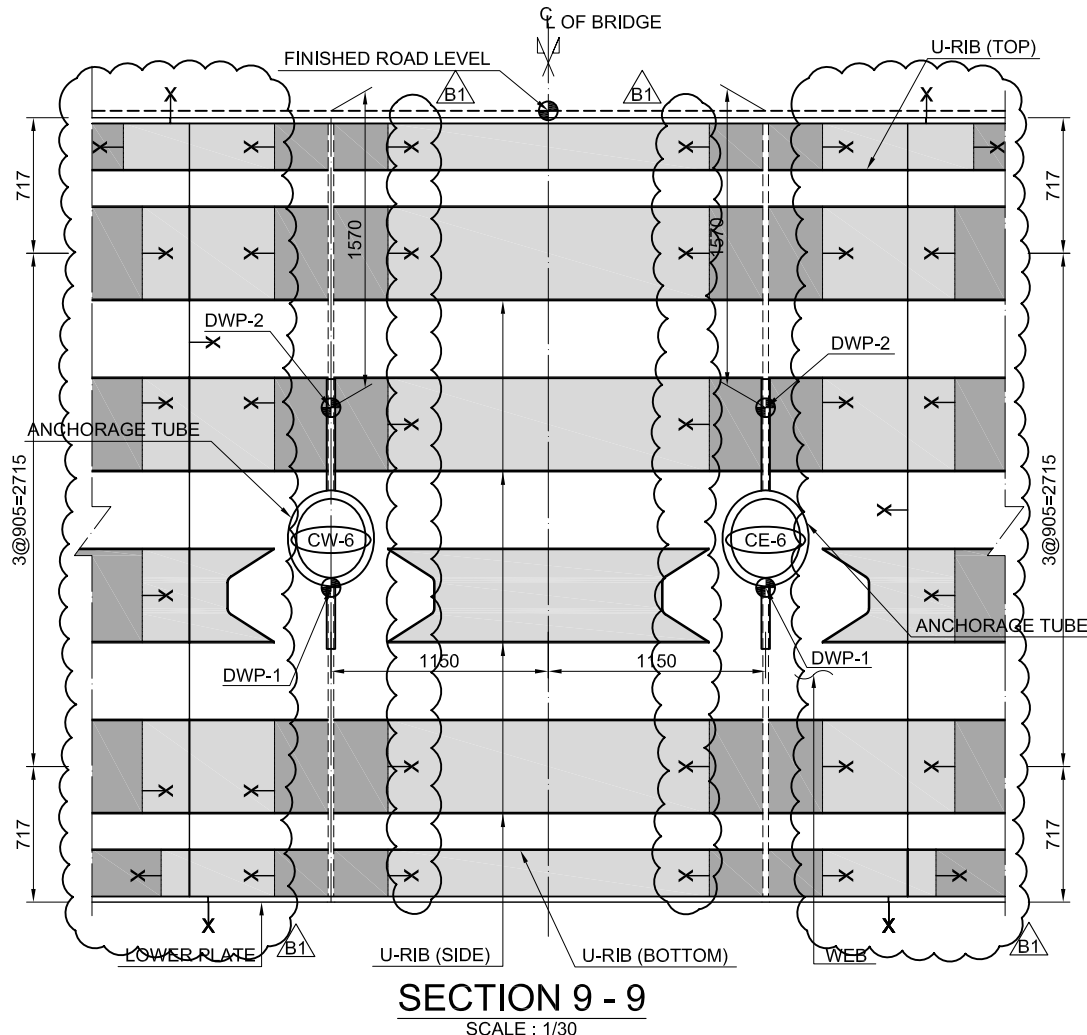
DRAWING TITLE
MAIN BRIDGE
STEEL CROSS BEAM
DETAILS 9/12

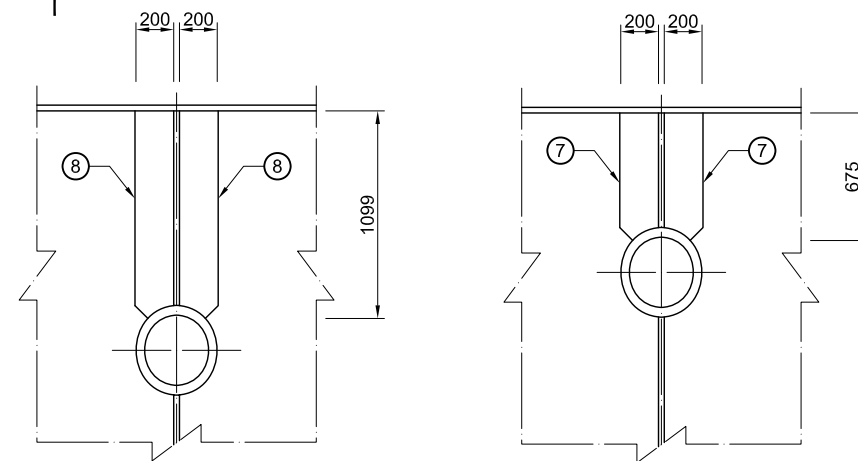
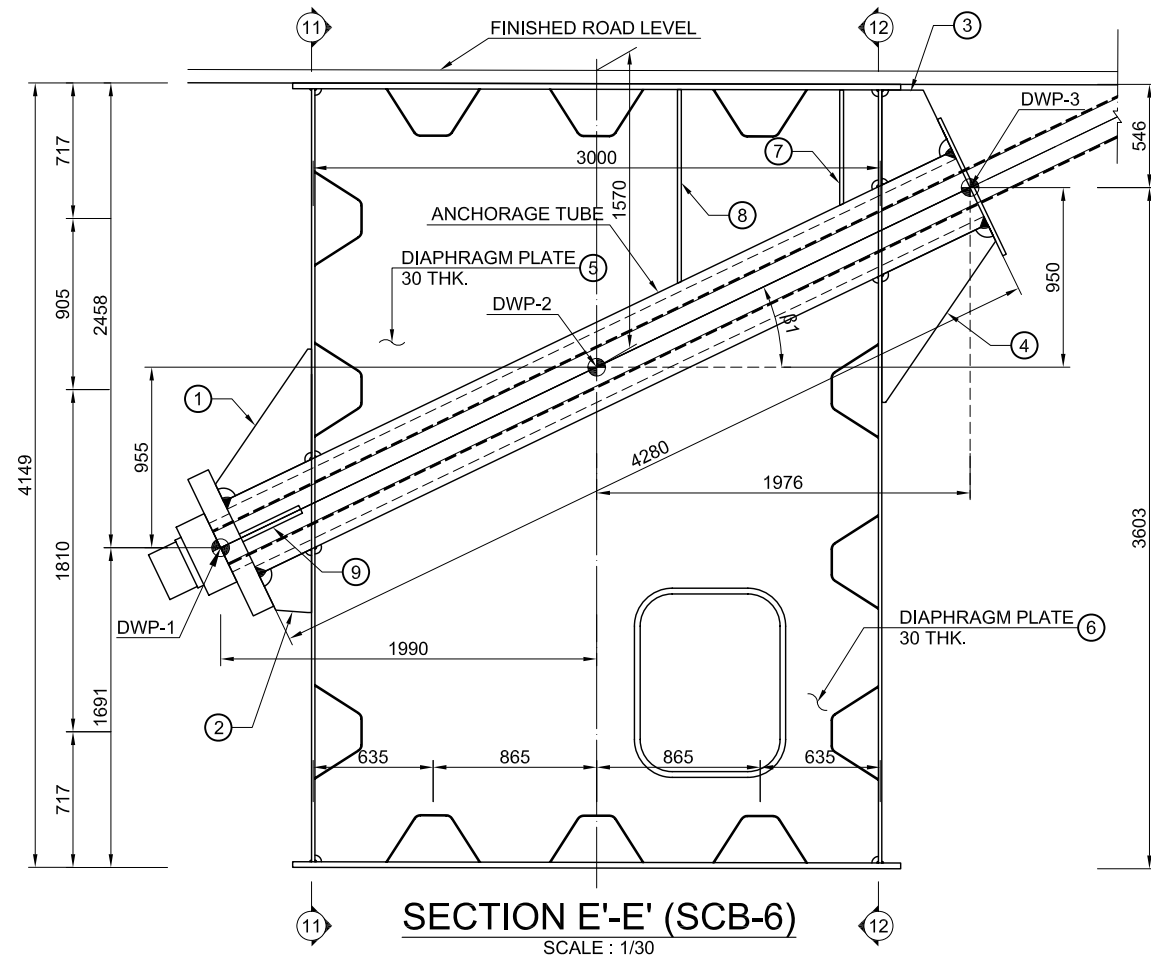
SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	HSK	DKK
DATE ISSUED	12/07/15	12/07/15	12/07/15	12/07/15

CONTRACTOR
HYUNDAI ENGINEERING & CONSTRUCTION
Combined Group Contracting Company

DESIGNER
SYSTRA

DRAWING NO.
RA140-22-BRG-CW-DW-34489 B1





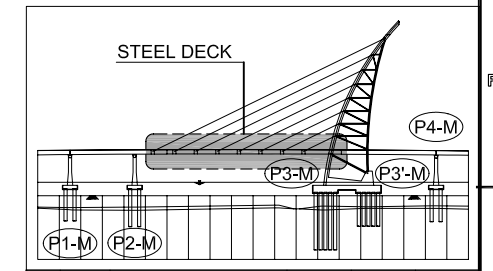
(SCB-6 / A CABLE)

ID	MEMBER	△ B1	COUNT	DIMENSION	REMARKS
①	STIFFENER		1 NOS.	806x509x45 THK.	
②	STIFFENER		1 NOS.	336x280x45 THK.	
③	STIFFENER		1 NOS.	503x374x30 THK.	
④	STIFFENER		1 NOS.	943x603x30 THK.	
⑤	DIAPHRAGM		1 NOS.	1951x2982x30 THK.	
⑥	DIAPHRAGM		1 NOS.	3102x2982x30 THK.	
⑦	STIFFENER		2 NOS.	675x200x20 THK.	
⑧	STIFFENER		2 NOS.	1099x200x20 THK.	
⑨	STIFFENER		2 NOS.	350x100x45 THK.	

QUANTITY TABLE
SCALE : NONE

- NOTES:**
- ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
 - STEEL MATERIALS:
PLATES ASTM A709M (GRADE 345)
 - FOR SECTION E'-E' REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34481 TO 34482 SECTION E-E.
 - FOR B1, DWP-1, DWP-2, DWP-3 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34653.
 - COPE HOLES IN STIFF-1 TO STIFF-4 SHALL BE CLOSED AFTER WELDING.

- LEGEND:**
- ✕ : WELDING SPLICE
⊗ : FIELD WELDING SPLICE
- DWP-1 : DECK WORKING POINT-1
DWP-2 : DECK WORKING POINT-2
DWP-3 : DECK WORKING POINT-3
SCB : STEEL CROSS BEAM
CW : WEST SIDE STAY CABLE
CE : EAST SIDE STAY CABLE



REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHEC.	APPRO.
B1	17/02/16	Updated As Shown In Clouds	SWK	HSK	DKK
A4	12/11/15	Updated As Shown In Clouds	SWK	HSK	DKK
A3	14/10/15	Updated As Shown In Clouds	SWK	HSK	DKK
A1	12/07/15	First Issue	SWK	HSK	DKK

EMPLOYER
**STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION**

PROJECT TITLE
**SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140**

DRAWING TITLE
**MAIN BRIDGE
STEEL CROSS BEAM
DETAILS 10/12**

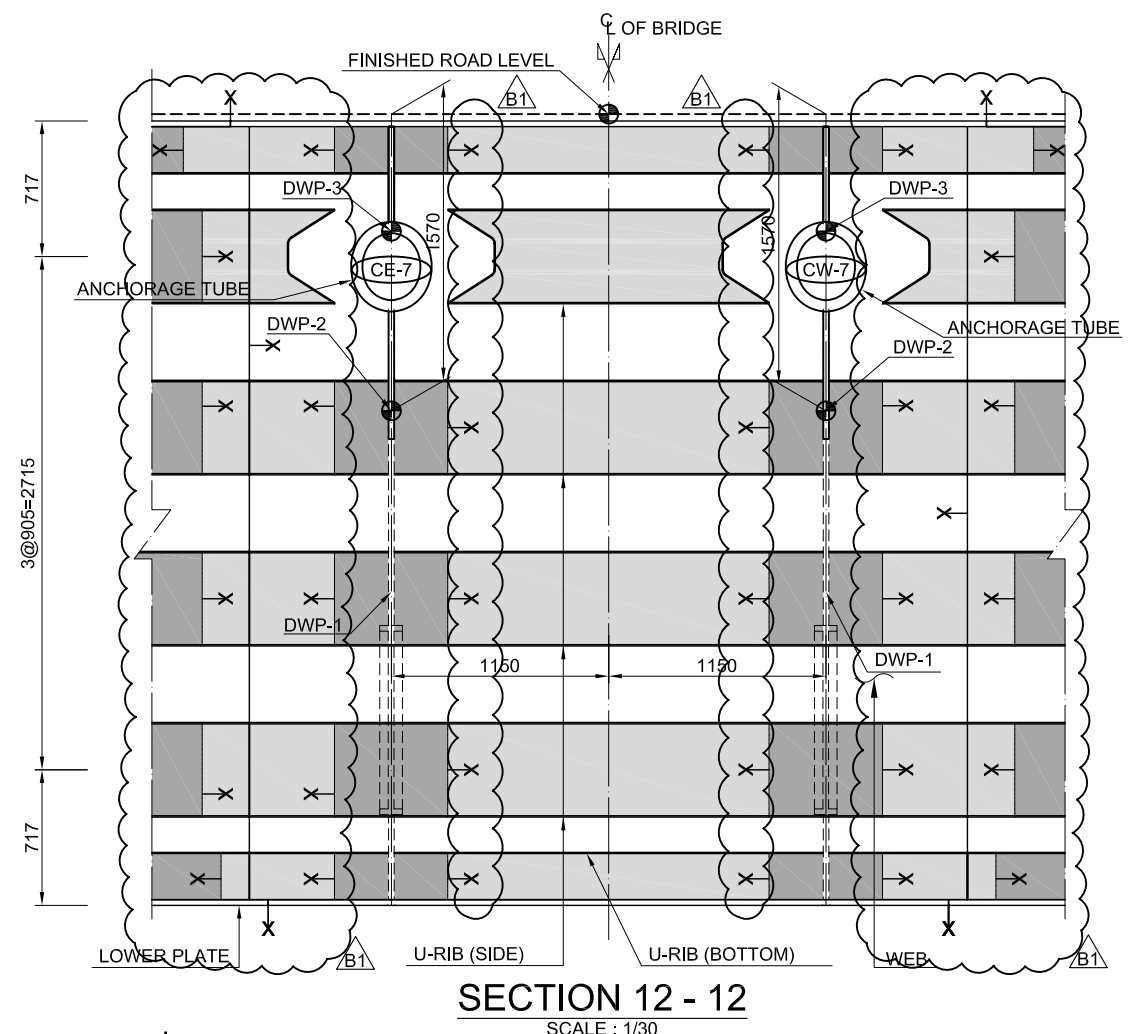
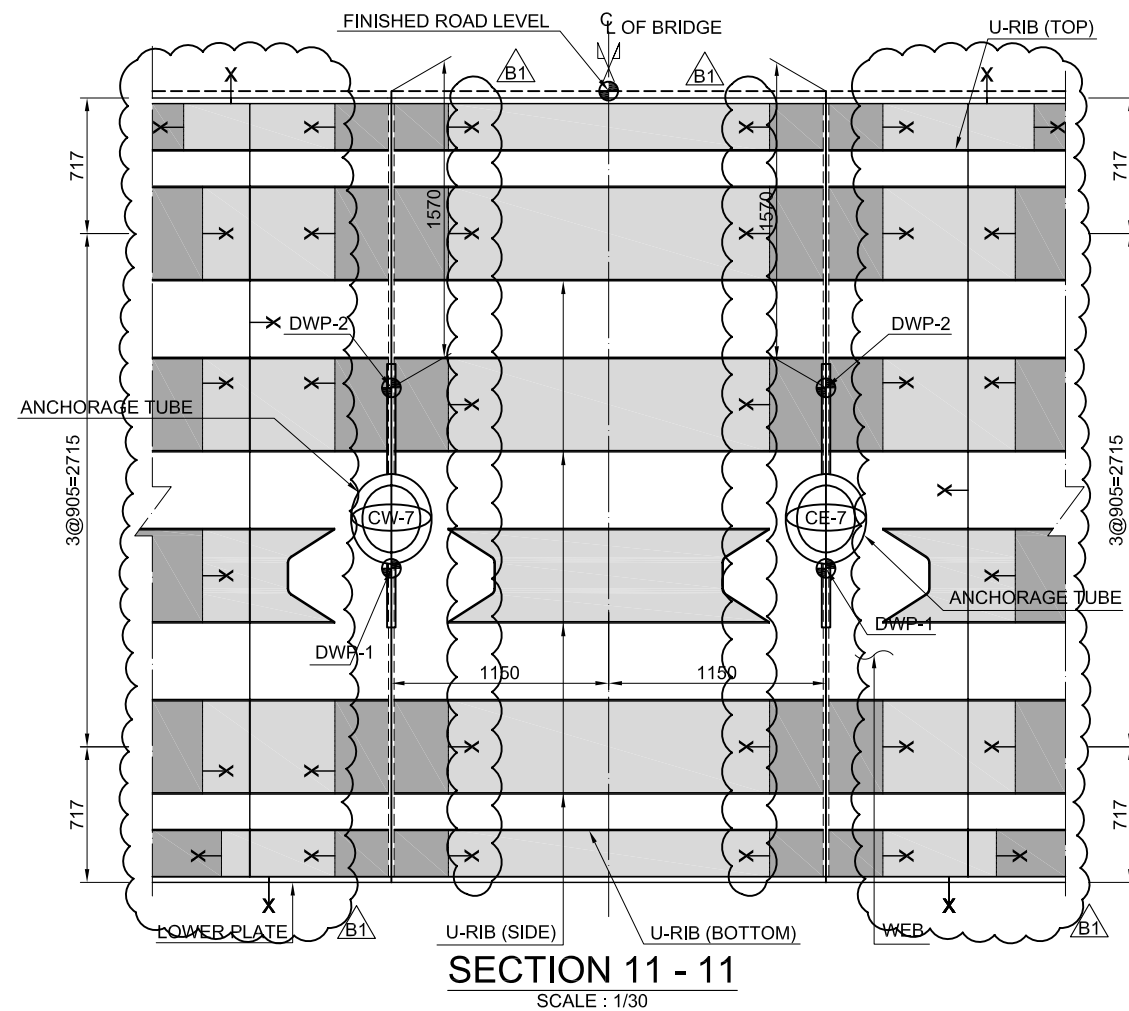
SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	HSK	DKK
DATE ISSUED	12/07/15	12/07/15	12/07/15	12/07/15

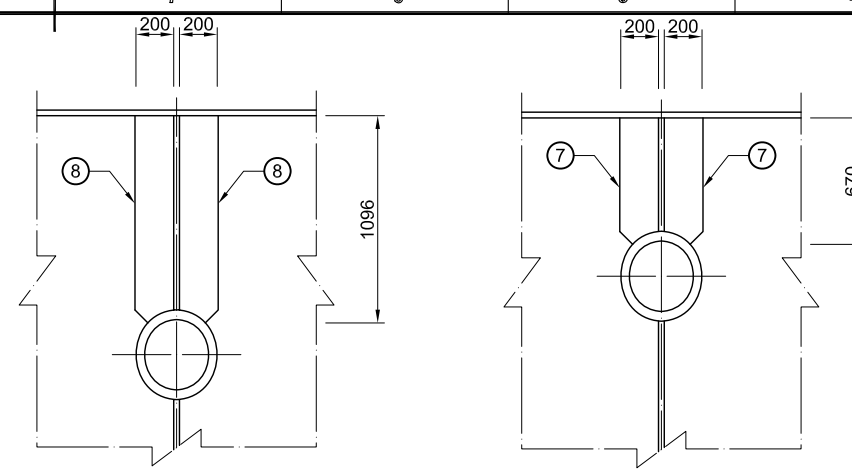
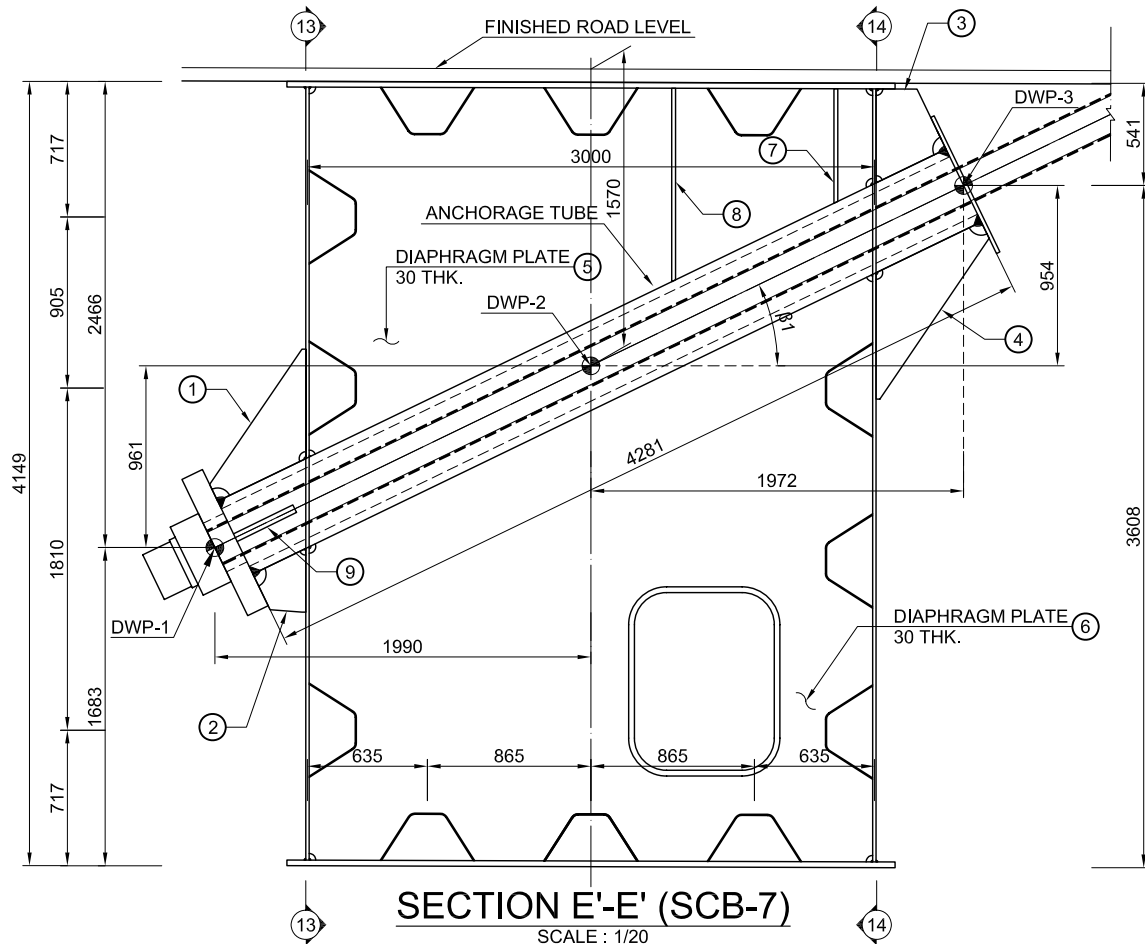
CONTRACTOR
HYUNDAI ENGINEERING & CONSTRUCTION **Combined Group**
Contracting Company

DESIGNER
SYSTRA

DRAWING NO.
RA140-22-BRG-CW-DW-34490

REV.
B1





(SCB-7 / A CABLE)				
ID	MEMBER	COUNT	DIMENSION	REMARKS
①	STIFFENER	1 NOS.	804x509x45 THK.	
②	STIFFENER	1 NOS.	338x280x45 THK.	
③	STIFFENER	1 NOS.	497x370x30 THK.	
④	STIFFENER	1 NOS.	937x598x30 THK.	
⑤	DIAPHRAGM	1 NOS.	1957x2982x30 THK.	
⑥	DIAPHRAGM	1 NOS.	3108x2982x30 THK.	
⑦	STIFFENER	2 NOS.	670x200x20 THK.	
⑧	STIFFENER	2 NOS.	1096x200x20 THK.	
⑨	STIFFENER	2 NOS.	350x100x45 THK.	

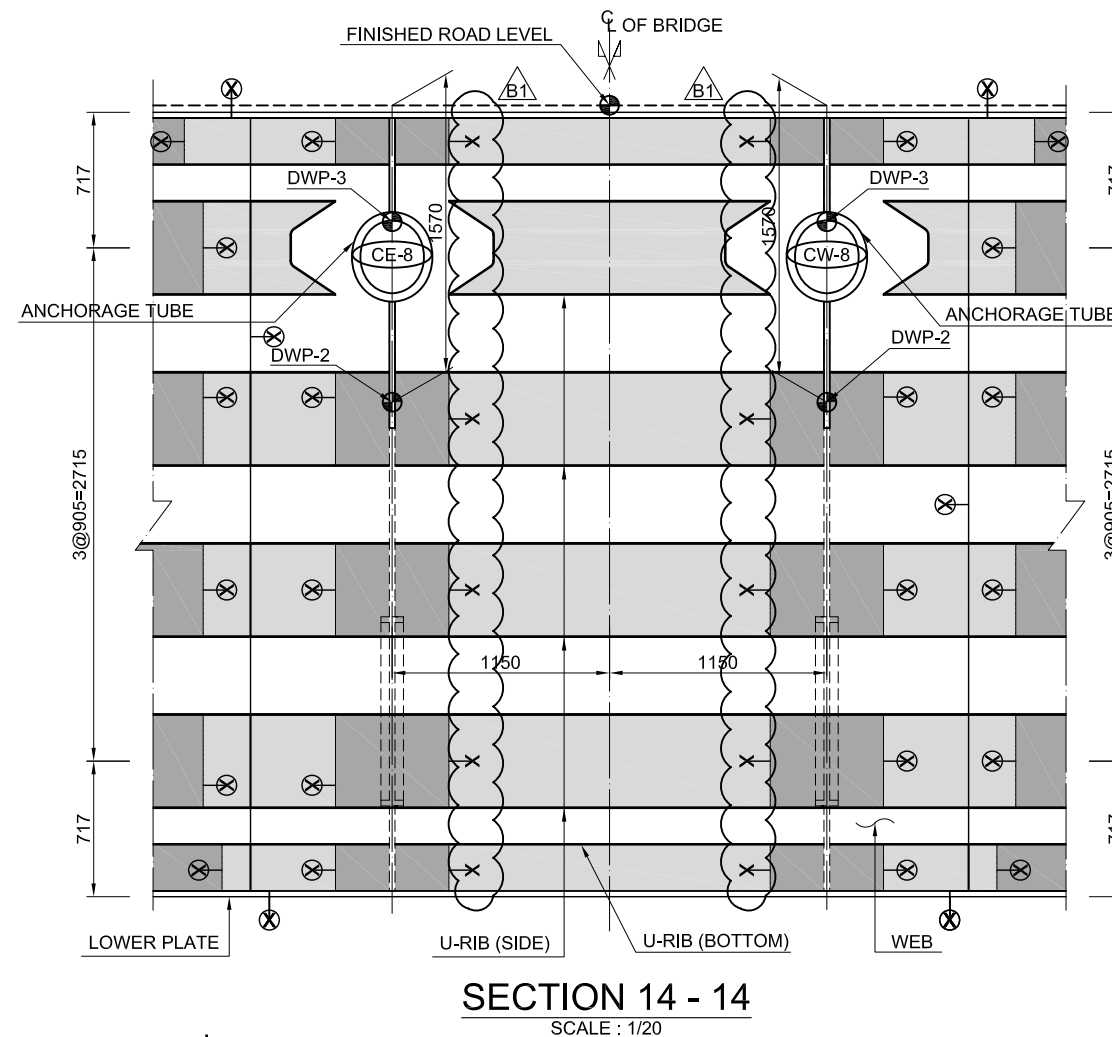
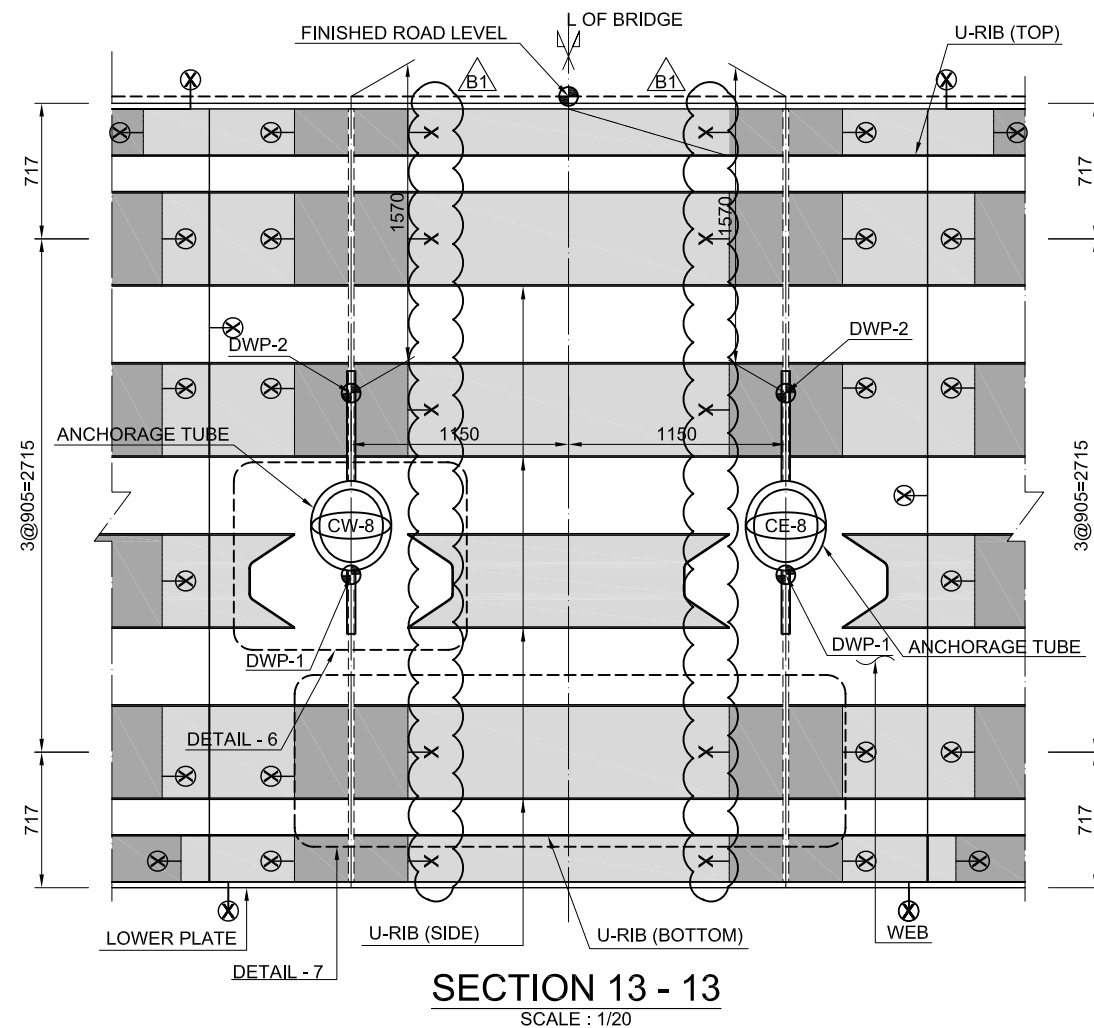
QUANTITY TABLE
SCALE : NONE

NOTES:

- ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
- STEEL MATERIALS:
PLATE IS ASTM A709M (GRADE 345)
- FOR SECTION E-E' REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34481 TO 34482 SECTION E-E.
- FOR DETAIL-6 TO 7 REFER TO DRAWING NO. RE140-22-BRG-CW-DW-34492.
- FOR β1, DWP-1, DWP-2, DWP-3 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34653.
- COPE HOLES IN STIFF-1 TO STIFF-4 SHALL BE CLOSED AFTER WELDING.

LEGEND:

- ✕ : WELDING SPLICE
⊗ : FIELD WELDING SPLICE
- DWP-1 : DECK WORKING POINT-1
DWP-2 : DECK WORKING POINT-2
DWP-3 : DECK WORKING POINT-3
- SCB : STEEL CROSS BEAM
CW : WEST SIDE STAY CABLE
CE : EAST SIDE STAY CABLE



STEEL DECK

(P1-M) (P2-M) (P3-M) (P4-M)

REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHEC.	APPRO.
B1	17/02/16	Updated As Shown In Clouds	SWK	HSK	DKK
A4	12/11/15	Updated As Shown In Clouds	SWK	HSK	DKK
A3	14/10/15	Updated As Shown In Clouds	SWK	HSK	DKK
A1	12/07/15	First Issue	SWK	HSK	DKK

EMPLOYER

STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION

PROJECT TITLE

SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

DRAWING TITLE

MAIN BRIDGE
STEEL CROSS BEAM
DETAILS 11/12

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	HSK	DKK
DATE ISSUED	12/07/15	12/07/15	12/07/15	12/07/15

CONTRACTOR

HYUNDAI ENGINEERING & CONSTRUCTION
Combined Group Contracting Company

DESIGNER

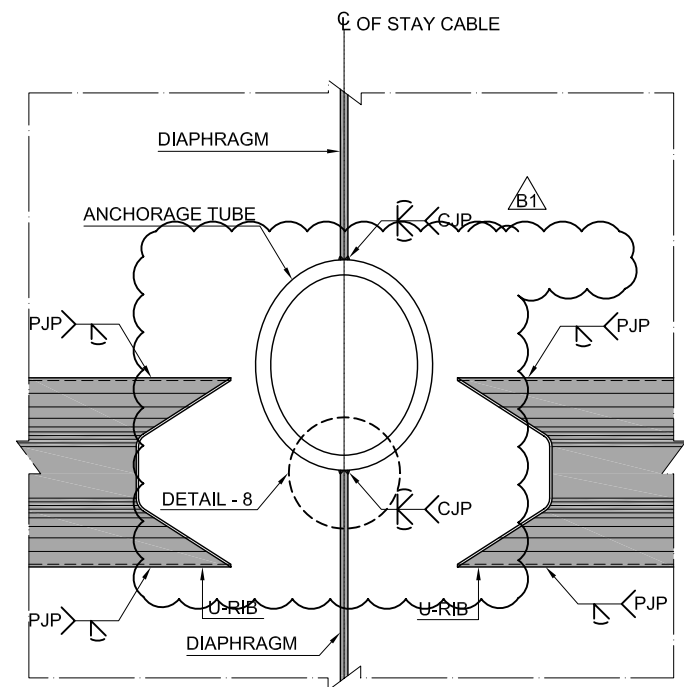
SYSTRA

DRAWING NO.

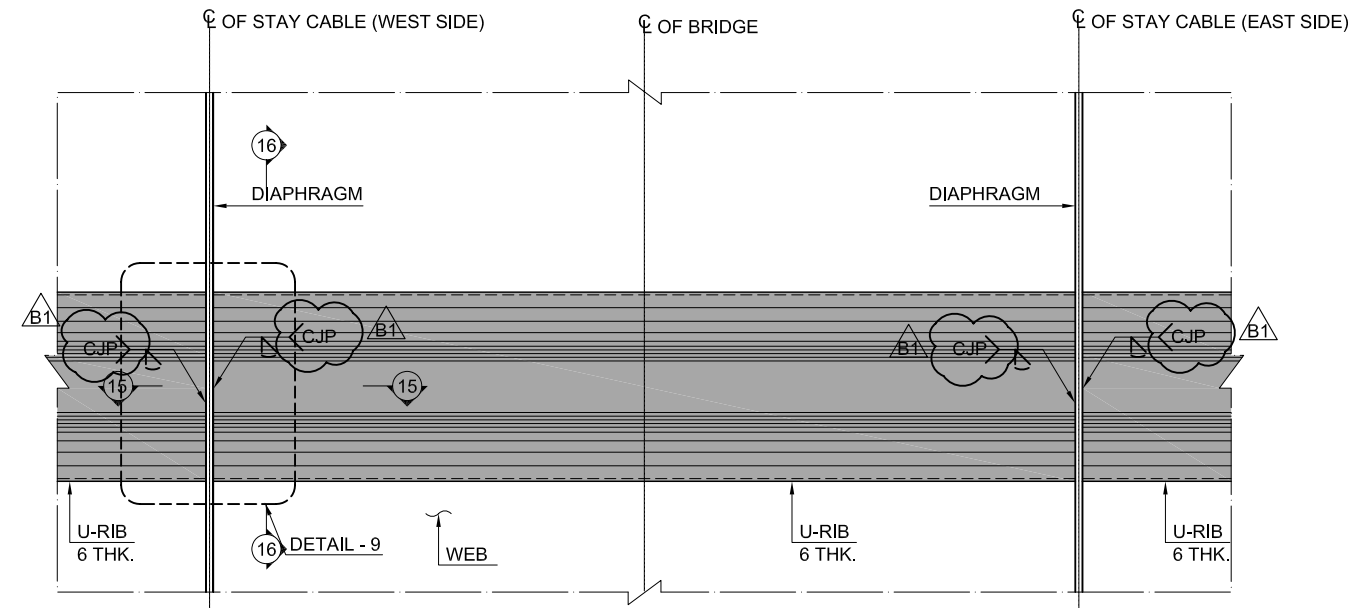
RA140-22-BRG-CW-DW-34491

REV.

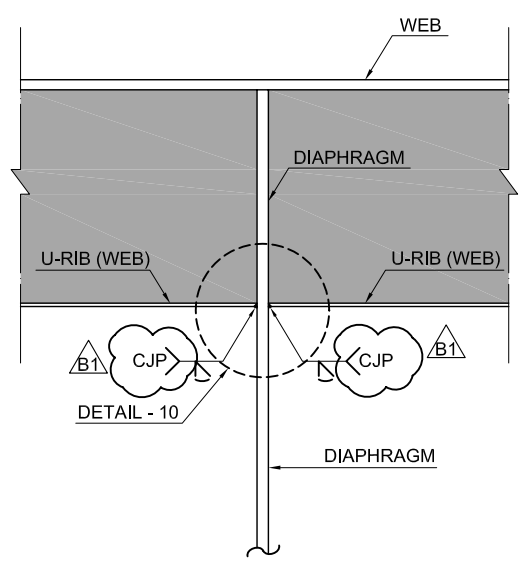
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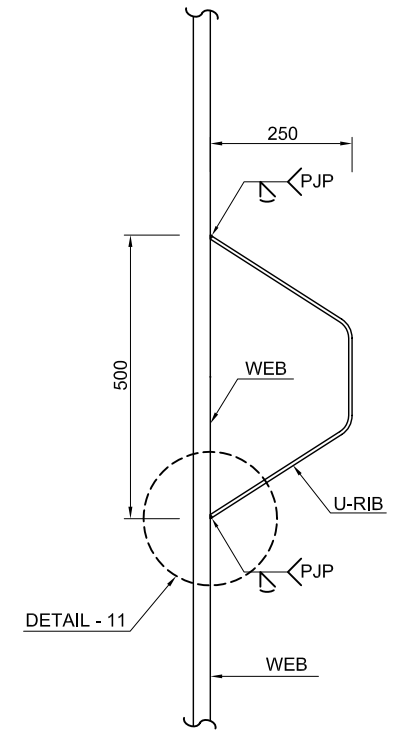
DETAIL - 6
SCALE : 1/10



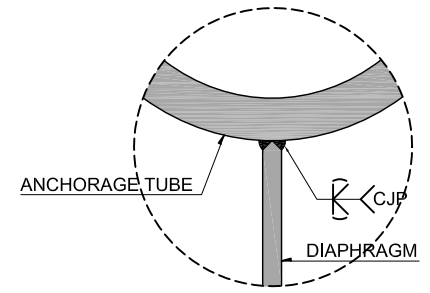
DETAIL - 7
SCALE : 1/10



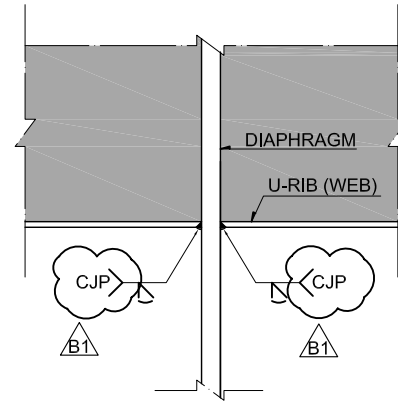
SECTION 15 - 15
SCALE : NONE



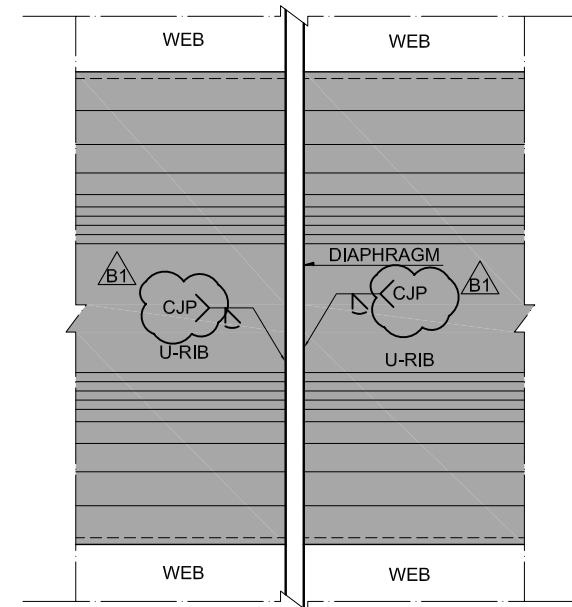
SECTION 16 - 16
SCALE : NONE



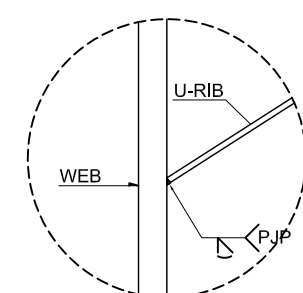
DETAIL - 8
SCALE : NONE



DETAIL - 10
SCALE : NONE

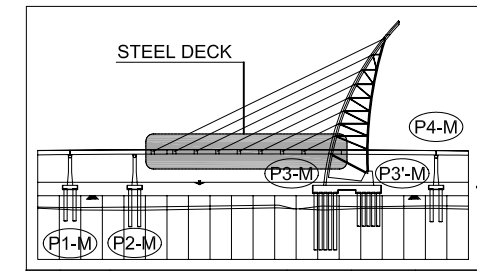


DETAIL - 9
SCALE : NONE



DETAIL - 11
SCALE : NONE

- NOTES:**
- ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
 - STEEL MATERIALS:
PLATE IS ASTM A709M (GRADE 345)
 - FOR DETAIL - 6 TO 7 REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34491.



REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHEC.	APPRO.
B1	17/02/16	Updated As Shown In Clouds	SWK	HSK	DKK
A3	14/10/15	Updated As Shown In Clouds	SWK	HSK	DKK
A2	17/08/15	Updated As Shown In Clouds	SWK	HSK	DKK
A1	12/07/15	First Issue	SWK	HSK	DKK

EMPLOYER
STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION

PROJECT TITLE
SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

DRAWING TITLE
MAIN BRIDGE
STEEL CROSS BEAM
DETAILS 12/12

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	HSK	DKK
DATE ISSUED	12/07/15	12/07/15	12/07/15	12/07/15

CONTRACTOR
HYUNDAI Engineering & Construction
Combined Group Contracting Company

DESIGNER
SYSTRA

DRAWING NO.
RA140-22-BRG-CW-DW-34492

REV.
B1

14	13	12	11	10	9	8	7	6	5	4	3	2	1									
NOTES:													B1									
1. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.																						
2. STEEL MATERIALS: PLATE IS ASTM A709M GRADE 345 FOR PART POSITION REFER TO DRAWING NO.RA140-22-BRG-CW-DW-34471.																						
3.																						
STEEL DATA																						
CLASSIFICATION	UNITS WEIGHT (kg/m ²)	STEEL DECK CROSS BEAM AND ANCHORAGE																				
STEEL PLATE	7,850	SCB-1 TO SCB-7																				
CALCULATIONS																						
MEMBER	STANDARD	UNIT WEIGHT (KG/M)	COUNT	WEIGHT (KG)	REMARKS																	
UPPER PLATE	1,569 x 4,620 x 30	7850 kg/m ²	2	3,414	SCB-1																	
UPPER PLATE	4,000 x 3,220 x 30	7850 kg/m ²	1	3,033																		
WEB	3,800 x 4,089 x 18	7850 kg/m ²	2	4,391																		
LOWER PLATE	6,883 x 4,620 x 30	7850 kg/m ²	2	14,978																		
LOWER PLATE	3,600 x 3,220 x 30	7850 kg/m ²	1	2,730																		
U-RIB (TOP)	766 x 850 x 6	7850 kg/m ²	6	184																		
U-RIB (TOP)	766 x 800 x 6	7850 kg/m ²	6	173																		
U-RIB (TOP)	766 x 290 x 6	7850 kg/m ²	6	63																		
U-RIB (TOP)	766 x 1,700 x 6	7850 kg/m ²	3	184																		
U-RIB (TOP)	766 x 290 x 6	7850 kg/m ²	6	63																		
U-RIB (SIDE)	766 x 650 x 6	7850 kg/m ²	4	94																		
U-RIB (SIDE)	766 x 700 x 6	7850 kg/m ²	12	303																		
U-RIB (SIDE)	766 x 290 x 6	7850 kg/m ²	12	126																		
U-RIB (SIDE)	766 x 1,700 x 6	7850 kg/m ²	6	368																		
U-RIB (SIDE)	766 x 290 x 6	7850 kg/m ²	12	126																		
U-RIB (SIDE)	766 x 1,500 x 6	7850 kg/m ²	4	216																		
U-RIB (SIDE)	766 x 3,050 x 6	7850 kg/m ²	4	440																		
U-RIB (SIDE)	766 x 710 x 6	7850 kg/m ²	4	102																		
U-RIB (SIDE)	766 x 1,720 x 6	7850 kg/m ²	2	124																		
U-RIB (SIDE)	766 x 4,550 x 6	7850 kg/m ²	4	657																		
U-RIB (BOTTOM)	766 x 5,551 x 6	7850 kg/m ²	6	1,202																		
U-RIB (BOTTOM)	766 x 600 x 6	7850 kg/m ²	6	130																		
U-RIB (BOTTOM)	766 x 290 x 6	7850 kg/m ²	6	63																		
U-RIB (BOTTOM)	766 x 1,700 x 6	7850 kg/m ²	3	184																		
U-RIB (BOTTOM)	766 x 290 x 6	7850 kg/m ²	6	63																		
DIA. PLATE	1,902 x 2,982 x 30	7850 kg/m ²	2	2,671																		
DIA. PLATE	3,052 x 2,982 x 30	7850 kg/m ²	2	4,287																		
DIA. PLATE	1,069 x 2,982 x 20	7850 kg/m ²	2	1,001																		
DIA. PLATE	2,238 x 2,982 x 20	7850 kg/m ²	2	2,096																		
DIA. PLATE	3,188 x 2,982 x 20	7850 kg/m ²	2	2,985																		
DIA. PLATE	496 x 2,982 x 20	7850 kg/m ²	2	464																		
STIFFENER	527 x 760 x 50	7850 kg/m ²	2	314																		
STIFFENER	325 x 261 x 50	7850 kg/m ²	2	67																		
STIFFENER	497 x 379 x 30	7850 kg/m ²	2	89																		
STIFFENER	963 x 626 x 30	7850 kg/m ²	2	284																		
STIFFENER	1,065 x 200 x 20	7850 kg/m ²	4	134																		
STIFFENER	661 x 200 x 20	7850 kg/m ²	4	83																		
STIFFENER	350 x 100 x 50	7850 kg/m ²	4	55																		
PLATE	120 x 3,257 x 10	7850 kg/m ²	2	61	ACCESS HOLE																	
PLATE	120 x 1,020 x 10	7850 kg/m ²	10	96	ACCESS HOLE																	
PLATE	120 x 1,220 x 10	7850 kg/m ²	8	92	ACCESS HOLE																	
PLATE	120 x 729 x 10	7850 kg/m ²	2	14	ACCESS HOLE																	
PLATE	463 x 2,965 x 10	7850 kg/m ²	2	216	ACCESS HOLE																	
PLATE	120 x 2,429 x 10	7850 kg/m ²	4	92	ACCESS HOLE																	
SUB TOTAL				48,509																		
STEEL DATA																						
CLASSIFICATION	UNITS WEIGHT (kg/m ²)	STEEL DECK CROSS BEAM AND ANCHORAGE																				
STEEL PLATE	7,850	SCB-1 TO SCB-7																				
CALCULATIONS																						
MEMBER	STANDARD	UNIT WEIGHT (KG/M)	COUNT	WEIGHT (KG)	REMARKS																	
UPPER PLATE	1,569 x 4,620 x 30	7850 kg/m ²	2	3,414	SCB-2																	
UPPER PLATE	4,000 x 3,220 x 30	7850 kg/m ²	1	3,033																		
WEB	3,800 x 4,089 x 18	7850 kg/m ²	2	4,391																		
LOWER PLATE	6,883 x 4,620 x 30	7850 kg/m ²	2	14,978																		
LOWER PLATE	3,600 x 3,220 x 30	7850 kg/m ²	1	2,730																		
U-RIB (TOP)	766 x 850 x 6	7850 kg/m ²	6	184																		
U-RIB (TOP)	766 x 800 x 6	7850 kg/m ²	6	173																		
U-RIB (TOP)	766 x 290 x 6	7850 kg/m ²	6	63																		
U-RIB (TOP)	766 x 1,700 x 6	7850 kg/m ²	3	184																		
U-RIB (TOP)	766 x 290 x 6	7850 kg/m ²	6	63																		
U-RIB (SIDE)	766 x 650 x 6	7850 kg/m ²	4	94																		
U-RIB (SIDE)	766 x 700 x 6	7850 kg/m ²	12	303																		
U-RIB (SIDE)	766 x 290 x 6	7850 kg/m ²	12	126																		
U-RIB (SIDE)	766 x 1,700 x 6	7850 kg/m ²	6	368																		
U-RIB (SIDE)	766 x 290 x 6	7850 kg/m ²	12	126																		
U-RIB (SIDE)	766 x 1,500 x 6	7850 kg/m ²	4	216																		
U-RIB (SIDE)	766 x 3,050 x 6	7850 kg/m ²	4	440																		
U-RIB (SIDE)	766 x 710 x 6	7850 kg/m ²	4	102																		
U-RIB (SIDE)	766 x 1,720 x 6	7850 kg/m ²	2	124																		
U-RIB (SIDE)	766 x 4,550 x 6	7850 kg/m ²	4	657																		
U-RIB (BOTTOM)	766 x 5,551 x 6	7850 kg/m ²	6	1,202																		
U-RIB (BOTTOM)	766 x 600 x 6	7850 kg/m ²	6	130																		
U-RIB (BOTTOM)	766 x 290 x 6	7850 kg/m ²	6	63																		
U-RIB (BOTTOM)	766 x 1,700 x 6	7850 kg/m ²	3	184																		
U-RIB (BOTTOM)	766 x 290 x 6	7850 kg/m ²	6	63																		
DIA. PLATE	1,907 x 2,982 x 30	7850 kg/m ²	2	2,678																		
DIA. PLATE	3,058 x 2,982 x 30	7850 kg/m ²	2	4,295																		
DIA. PLATE	1,069 x 2,982 x 20	7850 kg/m ²	2	1,001																		
DIA. PLATE	2,238 x 2,982 x 20	7850 kg/m ²	2	2,096																		
DIA. PLATE	3,188 x 2,982 x 20	7850 kg/m ²	2	2,985																		

STEEL DECK

P1-M

P2-M

P3-M

P4-M

B1	17/02/16	Updated As Shown in Clouds	SWK	HSH	DKK
A4	12/11/15	Updated As Shown In Clouds	SWK	HSH	DKK
A3	14/10/15	Updated As Shown In Clouds	SWK	HSH	DKK
A1	12/07/15	First Issue	SWK	HSH	DKK
REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHEC.	APPRO.

EMPLOYER

STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION

PROJECT TITLE

SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

DRAWING TITLE

MAIN BRIDGE
STEEL CROSS BEAM
STEEL LIST 1/3

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	HSH	DKK
DATE ISSUED	12/07/15	12/07/15	12/07/15	12/07/15

CONTRACTOR

HYUNDAI

ENGINEERING & CONSTRUCTION

Combined Group
Contracting Company

DESIGNER

SYSTRA

DRAWING NO.

RA140-22-BRG-CW-BS-34496

REV.

B1

MEMBER	STANDARD	UNIT WEIGHT (KG/M)	COUNT	WEIGHT (KG)	REMARKS
UPPER PLATE	1,569 x 4,620 x 30	7850 kg/m ²	2	3,414	SCB-4
UPPER PLATE	4,000 x 3,220 x 30	7850 kg/m ²	1	3,033	
WEB	3,800 x 4,089 x 18	7850 kg/m ²	2	4,391	
LOWER PLATE	6,883 x 4,620 x 30	7850 kg/m ²	2	14,978	
LOWER PLATE	3,600 x 3,220 x 30	7850 kg/m ²	1	2,730	
U-RIB (TOP)	766 x 850 x 6	7850 kg/m ²	6	184	
U-RIB (TOP)	766 x 800 x 6	7850 kg/m ²	6	173	
U-RIB (TOP)	766 x 290 x 6	7850 kg/m ²	6	63	
U-RIB (TOP)	766 x 1,700 x 6	7850 kg/m ²	3	184	
U-RIB (TOP)	766 x 290 x 6	7850 kg/m ²	6	63	
U-RIB (SIDE)	766 x 650 x 6	7850 kg/m ²	4	94	
U-RIB (SIDE)	766 x 700 x 6	7850 kg/m ²	12	303	
U-RIB (SIDE)	766 x 290 x 6	7850 kg/m ²	12	126	
U-RIB (SIDE)	766 x 1,700 x 6	7850 kg/m ²	6	368	
U-RIB (SIDE)	766 x 290 x 6	7850 kg/m ²	12	126	
U-RIB (SIDE)	766 x 1,500 x 6	7850 kg/m ²	4	216	
U-RIB (SIDE)	766 x 3,050 x 6	7850 kg/m ²	4	440	
U-RIB (SIDE)	766 x 710 x 6	7850 kg/m ²	4	102	
U-RIB (SIDE)	766 x 1,720 x 6	7850 kg/m ²	2	124	
U-RIB (SIDE)	766 x 4,550 x 6	7850 kg/m ²	4	657	
U-RIB (BOTTOM)	766 x 5,551 x 6	7850 kg/m ²	6	1,202	
U-RIB (BOTTOM)	766 x 600 x 6	7850 kg/m ²	6	130	
U-RIB (BOTTOM)	766 x 290 x 6	7850 kg/m ²	6	63	
U-RIB (BOTTOM)	766 x 1,700 x 6	7850 kg/m ²	3	184	
U-RIB (BOTTOM)	766 x 290 x 6	7850 kg/m ²	6	63	
DIA. PLATE	1,913 x 2,982 x 30	7850 kg/m ²	2	2,687	
DIA. PLATE	3,065 x 2,982 x 30	7850 kg/m ²	2	4,305	
DIA. PLATE	1,069 x 2,982 x 20	7850 kg/m ²	2	1,001	
DIA. PLATE	2,238 x 2,982 x 20	7850 kg/m ²	2	2,096	
DIA. PLATE	3,188 x 2,982 x 20	7850 kg/m ²	2	2,985	
DIA. PLATE	496 x 2,982 x 20	7850 kg/m ²	2	464	
STIFFENER	803 x 510 x 50	7850 kg/m ²	2	321	
STIFFENER	325 x 260 x 50	7850 kg/m ²	2	66	
STIFFENER	483 x 370 x 30	7850 kg/m ²	2	84	
STIFFENER	962 x 620 x 30	7850 kg/m ²	2	281	B1
STIFFENER	599 x 200 x 20	7850 kg/m ²	4	75	
STIFFENER	1,008 x 200 x 20	7850 kg/m ²	4	127	
STIFFENER	350 x 100 x 50	7850 kg/m ²	4	55	
PLATE	120 x 3,257 x 10	7850 kg/m ²	2	61	ACCESS HOLE
PLATE	120 x 1,020 x 10	7850 kg/m ²	10	96	ACCESS HOLE
PLATE	120 x 1,220 x 10	7850 kg/m ²	8	92	ACCESS HOLE
PLATE	120 x 729 x 10	7850 kg/m ²	2	14	ACCESS HOLE
PLATE	463 x 2,965 x 10	7850 kg/m ²	2	216	ACCESS HOLE
PLATE	120 x 2,429 x 10	7850 kg/m ²	4	92	ACCESS HOLE
				48,527	

48,527



MEMBER	STANDARD	UNIT WEIGHT (KG/M)	COUNT	WEIGHT (KG)	REMARKS
UPPER PLATE	1,569 x 4,620 x 30	7850 kg/m ²	2	3,414	SCB-5
UPPER PLATE	4,000 x 3,220 x 30	7850 kg/m ²	1	3,033	
WEB	3,800 x 4,089 x 18	7850 kg/m ²	2	4,391	
LOWER PLATE	6,883 x 4,620 x 30	7850 kg/m ²	2	14,978	
LOWER PLATE	3,600 x 3,220 x 30	7850 kg/m ²	1	2,730	
U-RIB (TOP)	766 x 850 x 6	7850 kg/m ²	6	184	
U-RIB (TOP)	766 x 800 x 6	7850 kg/m ²	6	173	
U-RIB (TOP)	766 x 290 x 6	7850 kg/m ²	6	63	
U-RIB (TOP)	766 x 1,700 x 6	7850 kg/m ²	3	184	
U-RIB (TOP)	766 x 290 x 6	7850 kg/m ²	6	63	
U-RIB (SIDE)	766 x 650 x 6	7850 kg/m ²	4	94	
U-RIB (SIDE)	766 x 700 x 6	7850 kg/m ²	12	303	
U-RIB (SIDE)	766 x 290 x 6	7850 kg/m ²	12	126	
U-RIB (SIDE)	766 x 1,700 x 6	7850 kg/m ²	6	368	
U-RIB (SIDE)	766 x 290 x 6	7850 kg/m ²	12	126	
U-RIB (SIDE)	766 x 1,500 x 6	7850 kg/m ²	4	216	
U-RIB (SIDE)	766 x 3,050 x 6	7850 kg/m ²	4	440	
U-RIB (SIDE)	766 x 710 x 6	7850 kg/m ²	4	102	
U-RIB (SIDE)	766 x 1,720 x 6	7850 kg/m ²	2	124	
U-RIB (SIDE)	766 x 4,550 x 6	7850 kg/m ²	4	657	
U-RIB (BOTTOM)	766 x 5,551 x 6	7850 kg/m ²	6	1,202	
U-RIB (BOTTOM)	766 x 600 x 6	7850 kg/m ²	6	130	
U-RIB (BOTTOM)	766 x 290 x 6	7850 kg/m ²	6	63	
U-RIB (BOTTOM)	766 x 1,700 x 6	7850 kg/m ²	3	184	
U-RIB (BOTTOM)	766 x 290 x 6	7850 kg/m ²	6	63	
DIA. PLATE	1,931 x 2,982 x 30	7850 kg/m ²	2	2,712	
DIA. PLATE	3,082 x 2,982 x 30	7850 kg/m ²	2	4,329	
DIA. PLATE	1,069 x 2,982 x 20	7850 kg/m ²	2	1,001	
DIA. PLATE	2,238 x 2,982 x 20	7850 kg/m ²	2	2,096	
DIA. PLATE	3,188 x 2,982 x 20	7850 kg/m ²	2	2,985	
DIA. PLATE	496 x 2,982 x 20	7850 kg/m ²	2	464	
STIFFENER	812 x 515 x 45	7850 kg/m ²	2	295	
STIFFENER	331 x 274 x 45	7850 kg/m ²	2	64	
STIFFENER	488 x 371 x 30	7850 kg/m ²	2	85	
STIFFENER	954 x 612 x 30	7850 kg/m ²	2	275	B1
STIFFENER	1,071 x 200 x 20	7850 kg/m ²	4	135	
STIFFENER	659 x 200 x 20	7850 kg/m ²	4	83	
STIFFENER	350 x 100 x 45	7850 kg/m ²	4	49	
PLATE	120 x 3,257 x 10	7850 kg/m ²	2	61	ACCESS HOLE
PLATE	120 x 1,020 x 10	7850 kg/m ²	10	96	ACCESS HOLE
PLATE	120 x 1,220 x 10	7850 kg/m ²	8	92	ACCESS HOLE
PLATE	120 x 729 x 10	7850 kg/m ²	2	14	ACCESS HOLE
PLATE	463 x 2,973 x 10	7850 kg/m ²	2	216	ACCESS HOLE
PLATE	120 x 2,429 x 10	7850 kg/m ²	4	92	ACCESS HOLE
SUB TOTAL				48,554	

48,554



A triangle with the label 'B1' inside it.

MEMBER	STANDARD	UNIT WEIGHT (KG/M)	COUNT	WEIGHT (KG)	REMARKS
UPPER PLATE	1,569 x 4,620 x 30	7850 kg/m ²	2	3,414	SCB-6
UPPER PLATE	4,000 x 3,220 x 30	7850 kg/m ²	1	3,033	
WEB	3,800 x 4,089 x 18	7850 kg/m ²	2	4,391	
LOWER PLATE	6,883 x 4,620 x 30	7850 kg/m ²	2	14,978	
LOWER PLATE	3,600 x 3,220 x 30	7850 kg/m ²	1	2,730	
U-RIB (TOP)	766 x 850 x 6	7850 kg/m ²	6	184	
U-RIB (TOP)	766 x 800 x 6	7850 kg/m ²	6	173	
U-RIB (TOP)	766 x 290 x 6	7850 kg/m ²	6	63	
U-RIB (TOP)	766 x 1,700 x 6	7850 kg/m ²	3	184	
U-RIB (TOP)	766 x 290 x 6	7850 kg/m ²	6	63	
U-RIB (SIDE)	766 x 650 x 6	7850 kg/m ²	4	94	
U-RIB (SIDE)	766 x 700 x 6	7850 kg/m ²	12	303	
U-RIB (SIDE)	766 x 290 x 6	7850 kg/m ²	12	126	
U-RIB (SIDE)	766 x 1,700 x 6	7850 kg/m ²	6	368	
U-RIB (SIDE)	766 x 290 x 6	7850 kg/m ²	12	126	
U-RIB (SIDE)	766 x 1,500 x 6	7850 kg/m ²	4	216	
U-RIB (SIDE)	766 x 3,050 x 6	7850 kg/m ²	4	440	
U-RIB (SIDE)	766 x 710 x 6	7850 kg/m ²	4	102	
U-RIB (SIDE)	766 x 1,720 x 6	7850 kg/m ²	2	124	
U-RIB (SIDE)	766 x 4,550 x 6	7850 kg/m ²	4	657	
U-RIB (BOTTOM)	766 x 5,551 x 6	7850 kg/m ²	6	1,202	
U-RIB (BOTTOM)	766 x 600 x 6	7850 kg/m ²	6	130	
U-RIB (BOTTOM)	766 x 290 x 6	7850 kg/m ²	6	63	
U-RIB (BOTTOM)	766 x 1,700 x 6	7850 kg/m ²	3	184	
U-RIB (BOTTOM)	766 x 290 x 6	7850 kg/m ²	6	63	
DIA. PLATE	1,951 x 2,982 x 30	7850 kg/m ²	2	2,740	
DIA. PLATE	3,102 x 2,982 x 30	7850 kg/m ²	2	4,357	
DIA. PLATE	1,069 x 2,982 x 20	7850 kg/m ²	2	1,001	
DIA. PLATE	2,238 x 2,982 x 20	7850 kg/m ²	2	2,096	
DIA. PLATE	3,188 x 2,982 x 20	7850 kg/m ²	2	2,985	
DIA. PLATE	496 x 2,982 x 20	7850 kg/m ²	2	464	
STIFFENER	806 x 509 x 45	7850 kg/m ²	2	290	
STIFFENER	336 x 280 x 45	7850 kg/m ²	2	66	
STIFFENER	503 x 374 x 30	7850 kg/m ²	2	89	
STIFFENER	943 x 603 x 30	7850 kg/m ²	2	268	B1
STIFFENER	1,099 x 200 x 20	7850 kg/m ²	4	138	
STIFFENER	675 x 200 x 20	7850 kg/m ²	4	85	
STIFFENER	350 x 100 x 45	7850 kg/m ²	4	49	
PLATE	120 x 3,257 x 10	7850 kg/m ²	2	61	ACCESS HOLE
PLATE	120 x 1,020 x 10	7850 kg/m ²	10	96	ACCESS HOLE
PLATE	120 x 1,220 x 10	7850 kg/m ²	8	92	ACCESS HOLE
PLATE	120 x 729 x 10	7850 kg/m ²	2	14	ACCESS HOLE
PLATE	463 x 2,973 x 10	7850 kg/m ²	2	216	ACCESS HOLE
PLATE	120 x 2,429 x 10	7850 kg/m ²	4	92	ACCESS HOLE
SUB TOTAL				48,608	

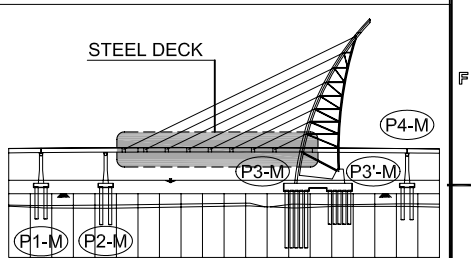
48,608



A triangle with the label B1 inside it.

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
2. STEEL MATERIALS: B1
PLATE IS ASTM A709M GRADE 345
3. FOR PART POSITION REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34471.



B1	17/02/16	Updated As Shown In Clouds	SWK	HSB	DKK
A4	12/11/15	Updated As Shown In Clouds	SWK	HSB	DKK
A3	14/10/15	Updated As Shown In Clouds	SWK	HSB	DKK
A1	12/07/15	First Issue	SWK	HSB	DKK
REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHEC.	APPRO.

EMPLOYER

STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION



PROJECT TITLE

SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

DRAWING TITLE

MAIN BRIDGE
STEEL CROSS BEAM
STEEL LIST 2/3

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
AS SHOWN	SWK	CYH	HSH	DKK
DATE ISSUED				
12/07/15	12/07/15	12/07/15	12/07/15	12/07/15

CONTRACTOR



DESIGNER



DRAWING NO.

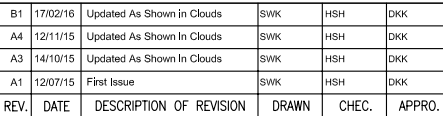
RA140-22-BRG-CW-BS-34497 E

EV.

1	A
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QUANTITY OF STEEL(CROSS BEAM) - 3

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
2. STEEL MATERIALS:  **PLATE IS ASTM A709M (GRADE 345)**
3.  **FOR PART POSITION REFER TO DRAWING NO. RA140-22-BRG-CW-DW-34471**



STATE OF KUWAIT
MINISTRY OF PUBLIC WORKS
ROADS ADMINISTRATION

SHEIKH JABER AL AHMAD AL SABAH
CAUSEWAY PROJECT (MAIN LINK)
CONTRACT RA/140

MAIN BRIDGE
STEEL CROSS BEAM
STEEL LIST 3/3

CONTRACTOR


SYSTRA

RA140-22-BRG-CW-BS-34498

B1